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A CYCLE OF MORPHINE ADDICTION

BIOLOGICAL AND PSYCHOLOGICAL STUDIES[1]

Part I: Biological Investigations[2]

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INTRODUCTION

The extensive literature dealing with the subject of morphine addiction is not a satisfactory index of the amount of available knowledge concerning the biological or psychological aspects of this problem. The bulk of the experimentation has been concerned with research on animals. A few investigators have reported on physiological changes produced by withdrawal of morphine in the addicted human (*1*, *2*, *3*), but there are no reports available in which a complete cycle of addiction has been studied, i. e., before, during, and after addiction. Data concerned with psychological aspects of addiction are particularly meager.

The problem of drug addiction is manifold. Some of the more important aspects involve psychiatry, sociology, penology, pharmacology, physiology, biochemistry, neurology, and psychology. These are all closely interrelated and interdependent. In adopting a pro-

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[2] Part II: Psychological Investigations, by Ralph R. Brown, Psychologist, will be published in the next issue of Public Health Reports.

gram involving studies only in biochemistry, physiology, and psychology, we were not unmindful of the importance of the other phases.

The purpose of this study was: (1) To shed more light on the nature of opiate addiction, (2) to discover whether the effects of morphine were qualitatively similar to those of addiction, and (3) to determine which, if any, of the phenomena studied were worthy of more intensive investigation.

A relatively large number of tests involving the techniques of biochemistry, physiology, and psychology were made on two human subjects throughout a cycle of addiction. The study extended over a period of 2 years. After preliminary tests to establish norms for these patients, morphine was given first in single doses of 20 mg. Later several doses per day were given and the amount was increased. Morphine was then rapidly withdrawn and the patients studied during withdrawal and recovery.

SUBJECTS

This report is based upon data obtained on two patients who were former opiate drug addicts, serving sentences for violations of the Harrison Narcotic Act. They were chosen, from a number of such patients who volunteered for the study, on the following basis: (1) Their sentences were sufficiently long to permit a prolonged investigation and still leave adequate time for recovery, (2) they had long addiction histories, having been addicted and "cured" many times (3) they showed promise of active and continued cooperation in a long, and at times, uncomfortable experiment. It was realized that the use of post-addicts might open the experiment to some criticism, but this was unavoidable, as it was not feasible to pursue such a study in the nonaddict at that time. Both patients were approximately 40 years of age, and without significant physical defects.

Patient G was "Boston-Irish," and came from a normal home environment. He quit school at the age of 14 and spent 2 years as a laborer in the painting and contracting business. The following 8 years were spent as a guard for an elevated railway company. He had worked as an attendant in a hospital for mental diseases, as a lifeguard, and more recently earned his living selling novelties on the streets of New York City. He never married but made a heterosexual adjustment of the promiscuous type.

He denied the excessive use of alcohol but first used narcotics in 1928 as a means of sobering up after alcoholic "sprees." He had undergone at least one voluntary and a number of involuntary "treatments" but relapsed each time.

Our first impression was that G was a rather stolid, even-tempered individual. During the course of the study, however, we came to know him as a very sensitive, "high-strung" person who was inclined to be overly suspicious and quite jealous of his various prerogatives.

On the Stanford-Binet test (1916 Revision) he attained a mental age of 17 years, 4 months, and scored somewhat below the average adult level on performance tests and on tests in which speed was an important factor.

Patient M was born in New York City, of parents with rather remote Irish ancestry. His parents were separated when he was 13 years of age and his period of adolescence was spent in the "red light district" of Hoboken, N. J., where he earned his living by selling newspapers and serving as an errand boy for the prostitutes with whom he made his home.

He began the use of narcotics at the age of 13 with the smoking of opium, after which he changed to heroin. His life from then on was interspersed with numerous jail and prison sentences, each being followed by his immediate return to the use of narcotic drugs. During the World War (1914–18) he served in the Canadian Army and was promoted to the rank of drill sergeant.

As a prisoner, he had learned how to "do time." He knew and understood institutional customs and was constantly, and often successfully, endeavoring to obtain the greatest momentary advantage. If he was frustrated in an attempt to achieve his objective, he took it philosophically, feeling that he had gambled and lost and would profit by that particular experience in his next gamble. He appeared to have no feelings of remorse concerning his addiction and devoted much time to making plans for his future so that he could, with the least amount of risk, return to the use of narcotic drugs.

An outstanding characteristic of M was his tendency to act impulsively. Usually his judgment, though hasty, was sound except in matters of ethics. This open, extratensive, confident, and aggressive personality was in distinct contrast to the inhibited, inwardly tense, fearful, and suspicious personality of G.

A definite animosity developed between the patients during the study. G accepted the leadership of M and allowed him to make decisions for both. He did this grudgingly, however, and his recognition of his own deficiencies led to an increasing resentment of M. M, on the other hand, took delight in "running the show" and in making better records in performance tests than G.

On the 1916 Revision of the Stanford-Binet test, M scored a mental age of 15 years, 4 months. He did well on the Kohs Blocks (score of 83) and Sequin Form Board (10 seconds), but was somewhat below average in those tests in which language played an important role.

FINDINGS

The study indicates that morphine addiction is accompanied by increases in: Body water, erythrocyte sedimentation, carbohydrate intake, and nocturnal activity; and by decreases in body weight, blood concentration, pulse rate, basal metabolism, and diastolic blood pressure. In some instances, e. g., blood concentration, the effects of morphine are qualitatively dissimilar to those of addiction. A reduction in efficiency was associated with addiction. The disturbance value of psychological stimuli was reduced by morphine. Among the items which should be more intensively investigated are: Nocturnal activity, body water, acid-base balance, and psychophysiological reactions.

GENERAL PROCEDURE

Test schedule.—Biological and psychological tests were given to each patient on alternate weeks, one receiving biological and the other psychological tests in any given week.

Dosage schedule.—In order to establish norms and to observe their general behavior, the patients were studied for 2 months before morphine was administered. They were then given single doses of 20 mg. morphine sulfate once weekly for 2 months. During the following 6 weeks the number of doses was increased, first to two and then to three injections per week, after which the drug was administered in single daily doses for 5 weeks. All single doses (20 mg.) were given between the hours of 7 and 9 a. m. At the end of the daily single-dosage period, the drug was withheld for 3 days to determine if physical dependence had developed. It was then given four times per day (6 a. m., 11 a. m., 4 p. m., and 10 p. m.) in increasing amounts reaching 300 mg. per day by the seventeenth day. The multiple injection period (period IV) was divided into four parts (A, B, C, and D) to show progressive changes. The daily average dosage for both patients in part A was 240 mg. per day. G was studied for only 36 days during this period (part A). M was kept on morphine for 6 months, the dosage levels being increased arbitrarily at intervals of 2 to 5 weeks, the highest dose being 4,440 mg. per day for 3 days just before the drug was dicontinued (table 1).

Division of experiment into periods.—In order to simplify reference to the various periods, the following divisions were made:

Period I	Before morphine (post-addiction).
Period II	Single doses of morphine.
Period III	3-day withdrawal.
Period IV	Multiple doses of morphine per day (parts A, B, C, D).
Period V	Withdrawal.
Period VI	Recovery (parts A, B, C, D, E).
Period VII	Post-addiction.

TABLE 1.—*Dosage schedule*

Period		Dates		Number days in period		Dosage (mg. morphine sulfate)			
						Daily average		Range	
		Patient		Patient		Patient		Patient	
		G	M	G	M	G	M	G	M
I Before morphine	....	Sept. 27, 1938 to Nov. 20, 1938	Sept. 27, 1938 to Nov. 20, 1938	55	55	....	....	....	....
II Single doses	1 per week	Nov. 21, 1938 to Jan. 15, 1939	Nov. 21, 1938 to Jan. 15, 1939	56	56	20	20	....	....
	2 to 3 per week	Jan. 16, 1939 to Feb. 26, 1939	Jan. 16, 1939 to Feb. 26, 1939	42	42	20	20	....	....
	Daily	Feb. 27, 1939 to Apr. 2, 1939	Feb. 27, 1939 to Apr. 2, 1939	35	35	20	20	....	....
III 3-day withdrawal	....	Apr. 3, 1939 to Apr. 5, 1939	Apr. 3, 1939 to Apr. 5, 1939	3	3	40 on 5th	40 on 5th	....	....
IV Multiple doses	A	Apr. 5, 1939 to May 10, 1939	Apr. 5, 1939 to May 14, 1939	36	40	230	245	40-300	40-300
	B	....	May 15, 1939 to Aug. 6, 1939	....	84	....	342	....	300-400
	C	....	Aug. 7, 1939 to Sept. 24, 1939	....	49	....	495	....	400-500
	D	....	Sept. 25, 1939 to Oct. 16, 1939	....	22	....	1,983	....	640-4,440
V Withdrawal	....	May 11, 1939 to May 21, 1939	Oct. 17, 1939 to Oct. 29, 1939	11	13	[1] 75 and 25	[2] 150 and 75	....	....
VI Recovery	A	May 22, 1939 to June 4, 1939	Oct. 30, 1939 to Nov. 12, 1939	14	14	....	....	....	....
	B	June 5, 1939 to July 30, 1939	Nov. 13, 1939 to Jan. 7, 1940	56	56	....	....	....	....
	C	July 31, 1939 to Sept. 24, 1939	Jan. 8, 1940 to Mar. 3, 1940	56	56	....	....	....	....
	D	Sept. 25, 1939 to Nov. 19, 1939	Mar. 4, 1940 to Apr. 28, 1940	56	56	....	....	....	....
	E	Nov. 20, 1939 to Jan. 14, 1940	Apr. 29, 1940 to May 17, 1940	56	19	....	....	....	....
VII Post-addiction	....	Jan. 15, 1940 to May 21, 1940	....	128	....	....	....	....	....

[1] 75 mg. on May 12, and 25 mg. on May 13.
[2] 150 mg. on Oct. 18, and 75 mg. on Oct. 19.

The withdrawal period was arbitrarily chosen as the first 11 days of abstinence for G, and the first 13 days for M. Morphine given during this period was for treatment of the abstinence syndrome and should not be confused with that given at other times. From the end of period V to the ninth month following withdrawal is considered to be the recovery period. It was divided into five parts (A, B, C, D, E)

to show progressive changes. The post-addiction period was arbitrarily chosen as beginning after 8 months of abstinence.

Observations made on patients.—Clinical observations, including rectal temperature, systolic and diastolic blood pressure, pulse, and respiration were made on each patient three times daily at 6 a. m., 2 p. m., and 10 p. m. The averages of these observations are reported in this study, except that during period I observations were taken only at 6 a. m., and therefore were not graphed. These observations were made with the patients recumbent after at least 10 minutes of rest in bed. Body weight (stripped) was taken each morning. Nocturnal activity was studied.

LABORATORY TESTS

ANALYSES FOR INTAKE AND OUTPUT

Collecting and Sampling

Foods.—Each serving during the "diet week" was accurately weighed in duplicate, one being given to the patient and the other composited by days and set aside for analysis. Any portion of food left on the plate was reweighed and a like amount removed from the portion set aside for analysis. Milk, cream, coffee, fruit juices, sugar, and butter were also weighed but not added to the composite set aside for analysis.

Urine.—Twenty-four samples were collected in bottles containing 1 cc. toluene. The volume and specific gravity of each sample were determined.

Feces.—Since it is somewhat difficult to obtain a uniform 24-hour specimen of feces, collections were made for 6-day periods, the patients being instructed always to attempt to move their bowels at the beginning and at the end of the collection period. When this was not possible, a plain enema was used. The exact amount of water was recorded and subtracted from the total amount of water found in the feces. The feces were kept in a refrigerator in a covered container with a small amount of thymol as a preservative. At the end of the collection period the weight was determined, the feces were thoroughly mixed, and samples removed for analysis.

Food Analysis

Water.—The water content of milk, cream, coffee, and fruit juices was calculated from the amount consumed and their respective water content as determined by periodic analyses. The solid food set aside for analysis was dried at 70° to 80° C. to constant weight. The water content of liquid and solid foods was added to the water drunk to give total water intake. After drying, the food was mixed, ground, and stored for further analysis.

Protein.—Nitrogen was determined in 5-gm. samples of the finely divided dried food by a macro-Kjeldahl method, and the protein

content calculated. The amount of protein in liquid foods, such as fruit juices, milk, and cream, was determined by calculation, using tables which were prepared by analyzing representative samples about once a month. The sum of the results determined by calculation and by chemical analysis gave the total amount of protein in the food.

Fat.—The fat content of the ground dried food was determined on 5-gm. samples by the Soxhlet extraction method; other ether-soluble substances which may have been extracted with the fat were considered to be insignificant. The fat content of liquid foods was calculated from their known composition and total weight. The sum of the fat content of solid and liquid foods represents the total weight of fat in the diet.

Carbohydrates.—Food was analyzed for ash, protein, fat, and water. Fibrous or undigestible matter was determined in feces. The total weight of the dried food minus these substances was taken as the weight of carbohydrate in solid food (it was assumed that no carbohydrate was present in the feces). The carbohydrate of liquid foods was calculated from tables of standard analyses.

Moisture content of the ground, dried food used for analyses.—After the oven-dried food had been weighed, it was ground as finely as possible with a meat grinder and transferred to glass fruit jars. This procedure resulted in absorption of some moisture in addition to the small amount of residual water not removed by the drying procedure. The moisture content of the ground, dried food was determined by weighing approximately 2 gm. in small crucibles before and after heating in an oven at 105° C. for 24 hours.

Ash.—The food dried at 105° C. was heated at a temperature sufficient for complete ashing without volatilizing minerals. The amount of ash was determined gravimetrically.

Fibrous and other undigestible matter.—Fibrous and other undigestible materials were approximated by calculation. Feces, dried on a water bath, contain, in addition to the fibrous material, ash, residual water, small amounts of fats, other ether-soluble matter, and nitrogenous matter calculated as protein. The total weight of these items was subtracted from the total weight of dried feces to obtain the weight of fibrous and undigestible matter.

Caloric intake.—The total caloric intake was calculated from the total protein, carbohydrate, and fat content of the diet, using the factors 4.0, 4.0, and 9.2, respectively. The percentage of calories derived from each food constituent was also calculated.

Water of oxidation.—Calculations for the determination of water of oxidation were made on the basis of the composition of the metabolic mixture. The total heat production was calculated as 2.42 times the weight of 24-hour insensible water obtained under conditions of normal activity. The amount of protein oxidized was calculated by

multiplying the excretory nitrogen by 6.25. After a few days on any given diet, the carbohydrate of the metabolic mixture is considered to be equal to the carbohydrate of the diet. The number of grams of fat oxidized was obtained by taking the difference between total heat production and the sum of heat derived from the oxidation of protein and carbohydrate, i. e., 4 calories per gram for each, divided by 9.54.

The water produced in the oxidation of this mixture is calculated by means of the following constants: Proteins and fats each yield 0.41 and 1.07 gm. of water, respectively, for each gram of material oxidized. The average factor for water of oxidation of carbohydrates was taken as 0.60, even though it varies slightly for the different carbohydrates. The sum of the values obtained from each dietary constituent constitutes the total water of oxidation.

Analysis of Urine

The total nitrogen was determined by the macro-Kjeldahl method, using 5.0-cc. samples. The water content was determined gravimetrically after the dehydration of 5.0-cc. samples.

Analysis of Feces

Water.—Approximately 100 gm. of the wet feces were placed in an evaporating dish with about 25 ml. of a 15-percent solution of acetic acid in ethyl alcohol. This was thoroughly mixed, and the contents evaporated to dryness on a water bath. The dried fecal material was thoroughly broken up and further dried in an oven at approximately 80° C. to constant weight.

Residual water.—Samples of the dried feces were thoroughly ground in a mortar and placed in jars for analyses. Approximately 2 gm. of the finely divided dried feces were placed in a covered crucible and weighed. This was then heated in an oven at 105° C. to constant weight, and the residual water calculated from the loss in weight.

Fibrous and other undigestible material.—It was assumed that the difference between residual water, ash, fat, and other ether-soluble matter and nitrogen (as protein) and the total dry weight of feces represents the weight of fibrous and other undigestible material.

Ash.—The crucible containing the dried sample of feces heated to 105° C. was placed in a muffle furnace and heated to a temperature at which ashing would be complete. From the loss in weight after ashing the percent of ash in the sample was calculated.

Fat and other ether-soluble matter.—Ten grams of the dried feces were placed in a Soxhlet extractor and extracted with ether for 2 hours. After the evaporation of the ether in the receiving flask, the flask with its contents was placed in a desiccator over calcium chloride for 24 hours and then reweighed. The percent of ether-soluble substances consisting of fats, pigment, and so forth was calculated in the sample.

Nitrogen.—The nitrogen in feces was determined on a fresh, wet specimen, using approximately 0.5 gm. of the thoroughly mixed sample. Analyses were made in triplicate, using the macro-Kjeldahl method.

ENERGY METABOLISM

Insensible Water Loss Per 24 Hours

Insensible water loss was determined and heat production calculated according to the method described by Newburgh (*4*). The computations were derived from the results of 6-day runs made on alternate weeks. The sum of the weight of the man at the end of the period, the total 6-day weight of urine, feces, and the metabolic carbon dioxide equivalent of the diet was subtracted from the sum of the weight of the man at the beginning of the period, the total weight of the food and liquid consumed, and the weight of the metabolic oxygen equivalent of food. This figure, divided by the number of days, represents the insensible water loss per day.

The total weight of oxygen and carbon dioxide equivalents of the metabolized food was calculated as follows (*4*): Each gram of metabolic protein, during its oxidation in the body, involves 1.38 gm. of oxygen and 1.46 gm. of carbon dioxide; each gram of fat involves 2.86 gm. of oxygen and 2.78 gm. of carbon dioxide; each gram of carbohydrate involves 1.13 gm. of oxygen and 1.54 gm. of carbon dioxide.

Insensible Weight Loss Under Basal Conditions

The weight loss was determined by means of a Sauter balance with an electromagnetic damping and mechanical recording device as described by Andrews, Oberst, and Williams (*5*). The insensible weight loss under basal conditions was calculated from the time required for a man to lose 10 gm. Immediately after a weight-loss run, collection of respired air was made which was analyzed for carbon dioxide and oxygen. From these analyses insensible water was calculated by the formula:

Insensible water = insensible weight loss − (CO_2—O_2).

Respiratory and Gaseous Exchange

The volume of the respired air was measured by drawing it through a wet test gas meter. Expired air was collected in a Douglas bag from which samples were removed and analyzed for oxygen and carbon dioxide by means of a Haldane, Henderson, Bailey (*6*) gas analysis apparatus. During the collection of the gas the respiratory rate was determined. Immediately after the run, body weight and height were taken in order to calculate the surface area.

BLOOD STUDIES

Blood Constituents and Properties Tested

Oxalated whole blood was analyzed for cell volume, sedimentation rate, hemoglobin, water, and specific gravity. Blood to be analyzed

for carbon dioxide content, chlorides, phosphates, pH, and nonprotein nitrogen was collected under oil in oxalated tubes. Specific gravity and water content were determined on plasma. Serum was analyzed for sodium, calcium, potassium, and protein.

Sedimentation rate was determined by the method of Wintrobe and Shumacker (*7*), and settling of the cells was read 60 minutes after the tubes were filled. The cell volume was then determined by centrifuging the blood at 3,000 r. p. m. for 30 minutes.

The carbon dioxide content was determined by the manometric method of Van Slyke and Neill (*8*), using the gas apparatus and technique of Van Slyke (*9*). The pH of plasma was determined by using a photoelectric colorimeter, according to the procedure described by Evelyn and Malloy (*10*).

Hemoglobin was determined by means of the Evelyn photoelectric colorimeter (*11*). The method described by Clark and Collip (*12*) was used for the determination of calcium. Inorganic phosphorus was determined by the method of Fiske and Subbarrow (*13*), the final solution was read in a photoelectric colorimeter. The total nitrogen of serum was determined by a macro-Kjeldahl method (*14*), and the nonprotein nitrogen of plasma subtracted to give the protein nitrogen. This was then multiplied by the factor 6.25 to obtain the total protein. The nonprotein nitrogen was determined by the procedure of Folin and Wu (*15*). The Wilson and Ball (*16*) procedure for chlorides in plasma was employed.

The specific gravity was determined by weighing 2 cc. of plasma or whole blood in a 25-cc. covered crucible. The water content was obtained by drying the specimen at 105° C. to constant weight.

Potassium was determined on the dried material remaining in the crucible by treating with one or two drops of concentrated sulphuric acid and ashing overnight at a low heat. The ash was dissolved in a few drops of dilute hydrochloric acid and water. The solution was transferred to a 15-cc. centrifuge tube and evaporated to dryness. The residue in the tube was analyzed for potassium by the method of Shohl and Bennett (*17*). The viscosity of serum was determined at 25° ± 0.02° C. by means of a Poissule viscosimeter as modified by Ostwald, using 2-cc. portions. The corresponding time of flow for 0.90-percent sodium chloride was 70.6 seconds.

Blood Volume and Thiocyanate Fluid Volume

These determinations were made simultaneously by combining the method of Gibson and Evelyn (*18*) for blood volume with that of Crandall and Anderson (*19*) for thiocyanate fluid volume.

NOCTURNAL ACTIVITY

Nocturnal activity was determined by having each patient sleep alternate weeks on a bed which was mounted on the floor of a Toledo

platform scale. The beam of the scale was extended and arranged so as to write on a smoked paper kymograph. With this arrangement the apparatus was sufficiently sensitive to record small movements such as that of the hand at the wrist or of the foot at the ankle. The patient went to bed at 10 p. m. and got up at 6 a. m. Movements were counted from 11 p. m. to 5:30 a. m. The total number of movements was counted. Another measure of the degree of the activity was made by measuring the length of each excursion exceeding 2 mm. on the kymograph paper and computing the sum. It was found that the results of the two methods, when charted on graph paper, gave almost identical curves; consequently, only the number of movements is reported in this study.

RESULTS

For purposes of clarity the data obtained in this study are divided into two parts: (1) Those reflecting changes incident to continued use of morphine, (2) those indicating changes resulting from single injections of morphine. The data representing the continued use of morphine are shown in graphic form in figures 1 though 11, and those

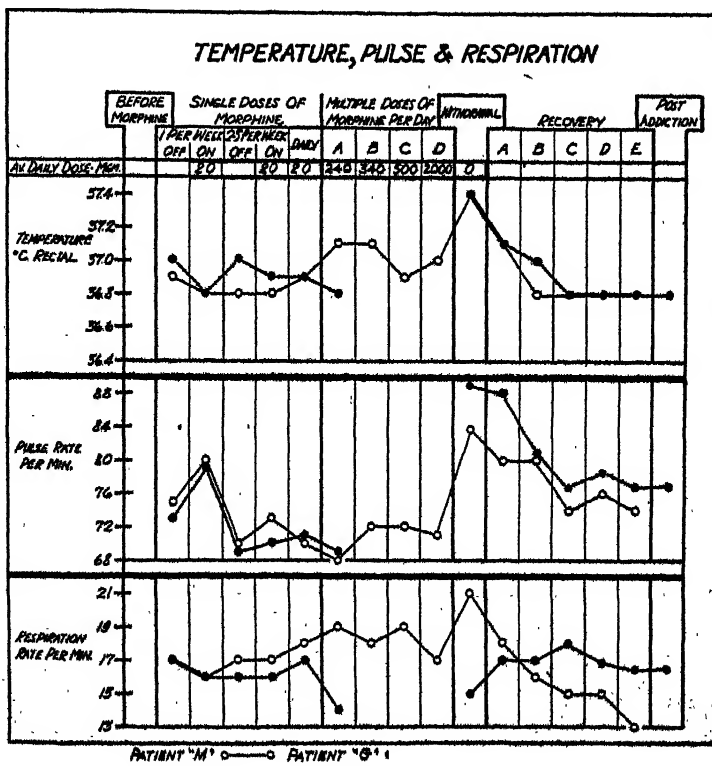

FIGURE 1.

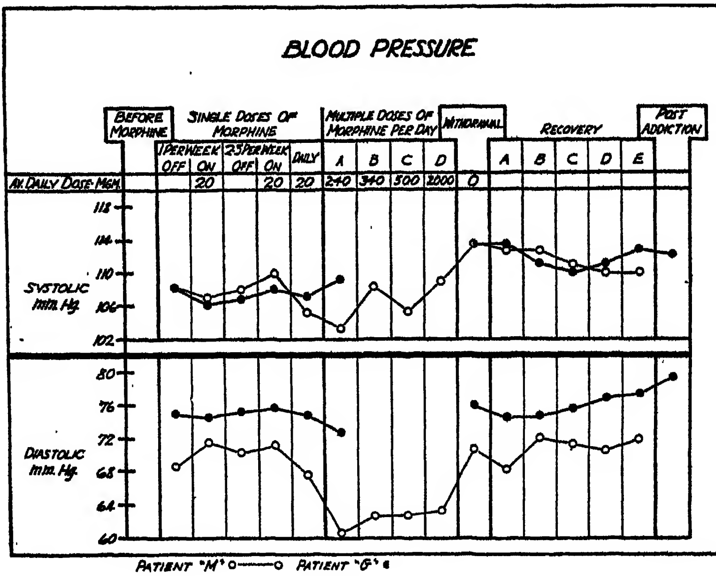

FIGURE 2.

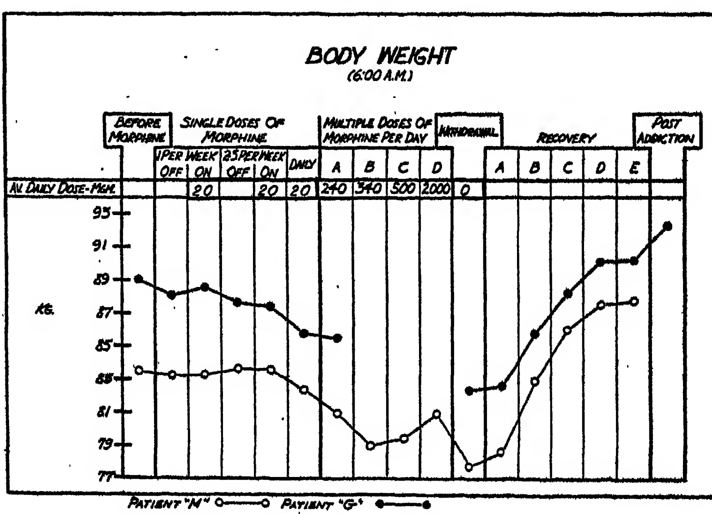

FIGURE 3.

representing the effect of a single injection of morphine are presented in tables 2 and 3. A more complete presentation of some of the data is given as follows.

Nocturnal Activity

The results of this study are shown in figure 4. When morphine was given two to three times per week, the activity during the nights following a morning injection was less than that during other nights.

TABLE 2.—*Average of changes in respiratory gaseous exchange and in insensible water loss under basal conditions 30 to 60 minutes after a dose of morphine*

Patient	Period of study	Dose (mg.)	Rate of respiration (per min.)	Volume of respired (cc. per min.)	Volume of carbon dioxide produced (cc. per min.)	Volume of oxygen consumed (cc. per min.)	Respiratory quotient	Basal metabolic rate (per cent)	Insensible weight loss (gm. per hr.)	Insensible water loss (gm. per hr.)	Heat production: Calculated from gas analyses (calories per sq. m. per hr.)	Heat production: Calculated from insensible water (calories per sq. m. per hr.)
	Period II											
G	2-3 per week	20		−320	−20	−1	−0.07	−2.6			−1.0	
M	2-3 per week	20		+40	+3	+1	+0.01	0.0			+0.1	
G	Daily	20	0	−850	−31	−22	−0.07	−10.2	−5.0	+0.9	−3.9	+0.2
M	Daily	20	−1	−1,200	−14	−14	−0.02	−6.1	−2.1	−2.2	−2.2	−2.8
	Period IV											
G	A	66	−1	−400	−2	0	−0.01	0.0	+6.3	+6.0	0.0	+7.4
M	A	66	−2	−410	−1	+3	−0.01	−0.3	0.0	−0.2	+0.2	−0.2
G	B											
M	B	75	+1	−120	0	+3	−0.01	+0.5	−1.2	−0.6	+0.2	−0.6
G	C											
M	C	125	−1	−610	−28	−25	−0.03	−11.6	−6.1	−6.4	−4.4	−8.2
Total tests:												
G			12	12	12	12	12		11	11		
M			28	23	23	28	28		26	26		
Tests showing an increase after morphine.			14	9	18	20	9		14	17		
Tests showing a decrease after morphine.			21	31	22	20	21		23	20		
Tests showing no changes			5	0	0	0	10		0	0		

TABLE 3.—*Blood changes found 1½ hours after a dose of morphine.* (*Results are per 100 cc. blood, plasma, or serum*)

Name	Period of study	Cell volume (per-cent)	Hemo-globin (gm.)	Specific gravity		Water		Sodium (mg.)	Potas-sium (mg.)	Cal-cium (mg.)	Chlo-rides (mg.)	Carbon dioxide content (mg.)	Phos-phorous (mg.)	Plasma protein (gm.)	Viscosity time relative to 71.2 for 0.90 percent NaCl (seconds)	Plasma pH
				Whole blood	Plasma	Whole blood (gm.)	Plasma (gm.)									
	Period II															
G	1 per week	[1] −0.5	0.0	[2] +0.001	−0.003	−0.01		0	+0.7		+14	−0.5	−0.02	+0.62	+1.8	+0.02
M	1 per week	0.0	+0.67	+0.003	−0.002	0.0	−0.03	+20	+3.1		−2	−1.6	+0.08			−0.01
G	2-3 per week	0.0	−0.20	+0.011	0.0	−0.4	−0.1	−11	+1.9		−3	+1.3	+0.31	−0.20	+2.2	−0.08
G	2-3 per week	+1.5	+0.45	+0.008	+0.001	−0.3	−0.4	−13	−0.9	+0.33	+6	−2.5	−0.65	+0.25	+3.4	0.0
M	2-3 per week	0.0	−0.31	−0.001	−0.002	−0.4	0.0	+13	+1.9		+2	−0.7	+0.12	−0.06	+0.2	+0.03
M	2-3 per week	+0.3	+0.20	+0.002	+0.001	0.0	+0.1	−3	+0.7	+0.71	+4	−0.2	+0.22	+0.37	+1.8	+0.04
G	Daily	+0.4	+0.23	+0.005	−0.002	+0.4	−0.5	+3	+2.1		−8	−0.4	−0.19	+0.18	+1.4	+0.07
M	Daily	+0.8	+0.12	−0.002		−0.5	+0.3	−4	+1.9	+0.42	−8	+3.1	−0.36	+1.06	+4.3	+0.12
	Period IV															
G	A	−0.3	+0.12	+0.003		+0.1		−8	+3.1	−0.33	−1	+1.5	−0.43	+0.74	+1.1	+0.03
M	B	+0.2	0.0	0.0	0.0	−0.3	0.0	−1	−1.7	+0.08	−3	+0.8	−0.70	0.0	+1.9	+0.01
M	B	+0.7	−0.10	+0.001	+0.003	−0.6	+0.2									
M	B	+3.3	+0.85	−0.002	0.0	−0.8	−0.2	+2	−1.2	+0.16	+29	+2.8	−0.21	+0.07	+1.3	0.0
M	C	+0.5	+0.12	−0.004	0.0	−0.6	+0.1	−3	+0.5	+0.08	+1	−2.3	−0.35	0.0	+1.2	0.0
M	C	−2.0	−0.27	−0.007		−0.8		−20	0.0	−0.16	+7	+0.5	+0.24	−0.33	−0.4	−0.01
M	C	−0.5	−0.19	−0.003		−0.4	+0.4									
Tests showing an increase after morphine		8	8	8	3	2	5	4	9	6	7	6	5	7	11	7
Tests showing a decrease after morphine		4	5	6	4	11	5	8	3	2	6	7	8	3	1	3
Tests showing no changes		3	2	1	4	2	2	1	1					2		3

[1] —indicates decrease.
[2] +indicates increase.

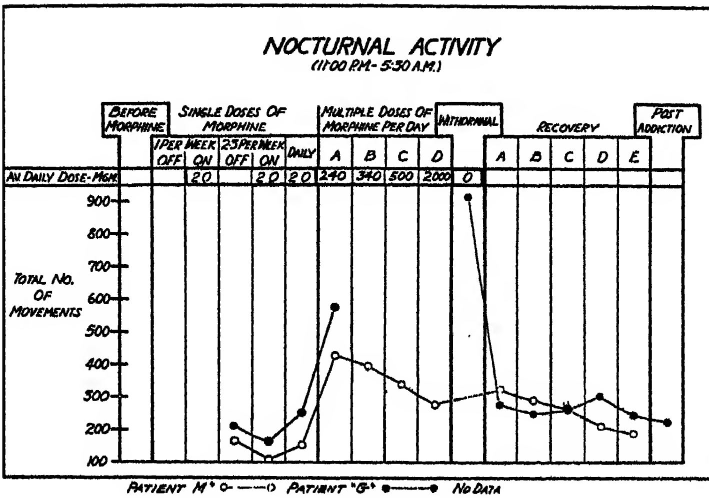

FIGURE 1

When the drug was administered daily, the activity was greater than that following single injections given two to three times per week. In period IV, the activity was increased immediately. This was followed by a general decrease, indicating development of tolerance to this effect.

Tolerance to effect on nocturnal activity. Because of this suggested development of tolerance the data for M were more completely analyzed than is possible on the basis of periods. It was found that there was a marked increase with the beginning of multiple injections. The patient was on 300 mg. of morphine daily for a period of 73 days. For the first part of this period his activity was about 450 movements per night, whereas, during the last part it was about 275 movements. The dosage was then raised to 400 mg. per day, for 37 days. No records were made except during the last week, at which time he showed an activity of 500 movements. The dosage was then raised to 500 mg. per day, for 46 days. During this period the activity was about 330 movements. Following this the dosage was rapidly increased, but the nocturnal activity did not increase with the dosage. It may be concluded from these data that the initial effect of daily doses of morphine or of increasing amounts of morphine (within limits) is an increase in nocturnal activity and that a partial tolerance is developed.

Water Studies

The water of oxidation is largely related to the type of food in the metabolic mixture and was used in calculating total water intake. The values were irregular, varying between 123 and 380 gm. per day.

Although actual results on total water intake and output are not shown in either table or graph form, no significant difference was noted

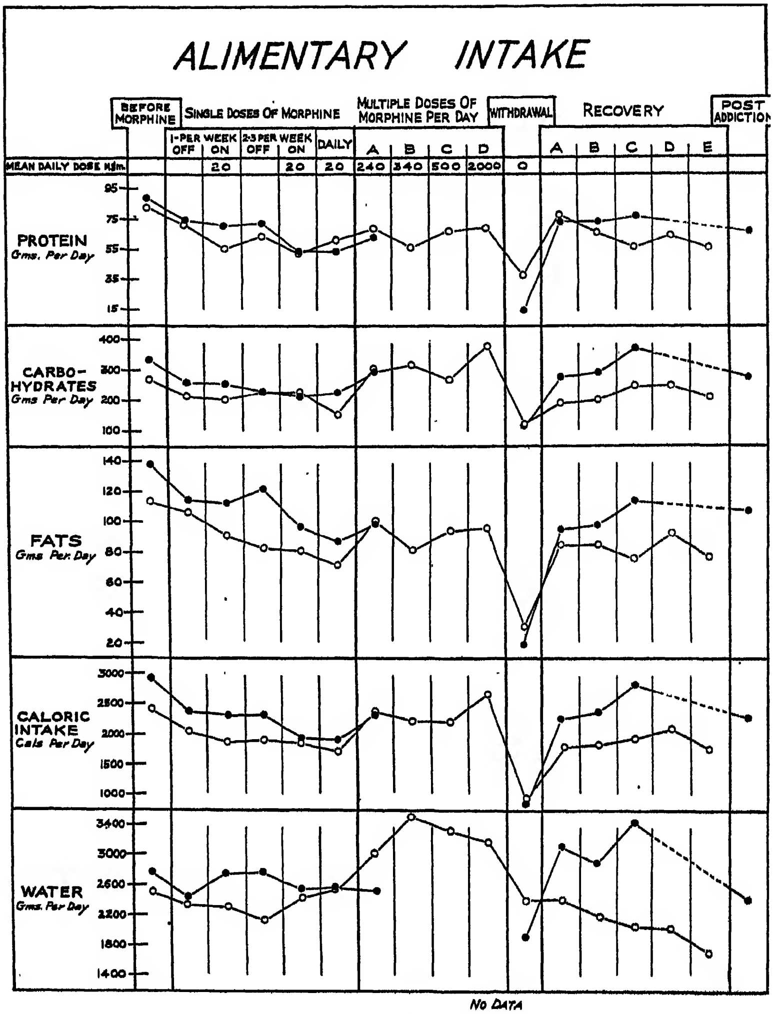

FIGURE 5.

for either measure in the various periods, except during the withdrawal period when the output exceeded the intake by about 600 cc. per day.

The studies of insensible water loss per 24 hours did not show any significant change in any period which could be attributed with certainty to drug effect or to addiction.

Insensible water determined under basal conditions was irregular and varied between 23.0 and 34.1 gm. per hour. No significant trends were noted in any of the periods studied.

Blood Studies

The data on blood concentration, blood volume, and extracellular water are shown in figures 9, 10, and 11. The values for sodium,

chloride, calcium, viscosity, inorganic phosphorus, potassium, protein, and CO_2 content were such that no conclusion could be drawn. Plans are being made to reinvestigate acid-base balance.

Erythrocyte sedimentation rate was increased in both patients as follows:

Patient	Period I	Period II	Period III	Period IV	Period V	Period VI	Period VII
	mm.	mm.		mm.	mm.	mm.	mm.
G	4	7	----------	----------	----------	5	3
M	26	28	----------	39	42	22	----------

The fact that the changes in period II are small and that M had an unexplained abnormally high value in period I justifies reference to unpublished data: Two patients on large doses of morphine for a period of 5 months had average readings of 4, 8, 23, 20, 21 and 12, 13, 20, 35, and 35 mm. at 60 min., respectively for the first, second, third, fourth, and fifth months of medication.

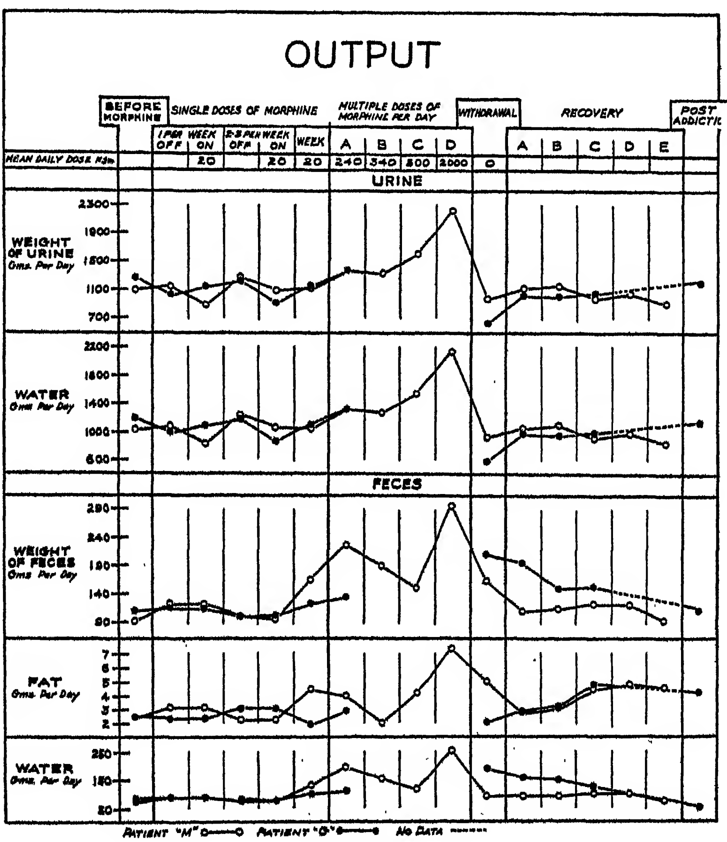

FIGURE 6.

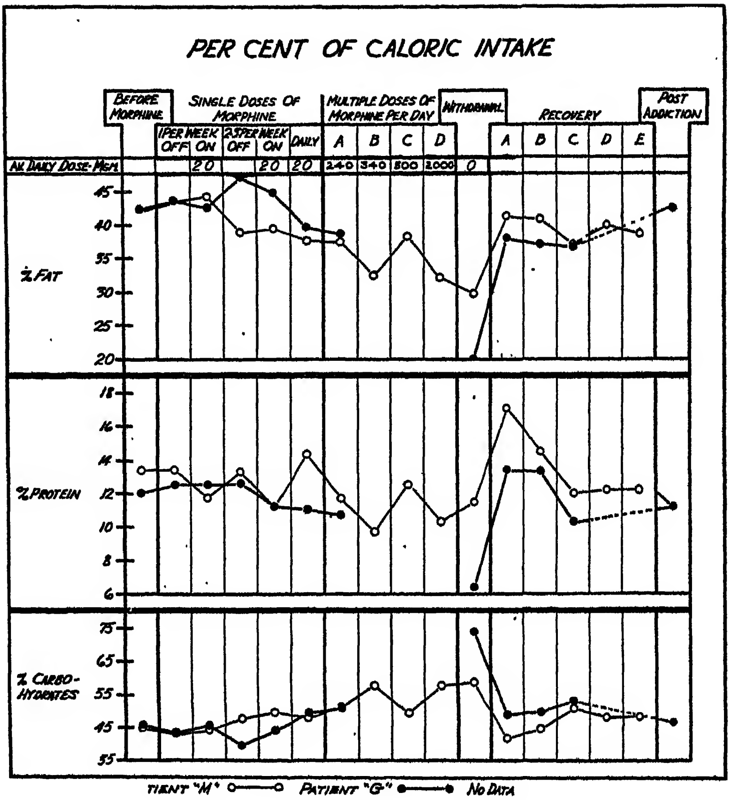

FIGURE 7.

Studies Before and After a Dose of Morphine

Is the effect of morphine the same in the tolerant as in the non-tolerant individual? In an attempt to shed some light on this question certain determinations were made before and 30 to 120 minutes after injections during periods II and IV.

Metabolism

Average changes in respiratory gaseous exchange and in insensible water loss under basal conditions 30 to 60 minutes after a dose of morphine are shown in table 2. Of 274 tests 158 showed a decrease after morphine. When the data were arranged as period averages, 48 of 72 averages showed a decrease. There was no evidence of change in the effect of morphine after dependence had developed.

Blood Changes 1½ Hours After Morphine

Although the data do not reveal any statistically significant changes there appears to be a tendency toward an increase in: Hemoglobin, cell volume, serum protein, viscosity of serum, plasma pH, serum potassium, and serum calcium; and a decrease in: Serum sodium and

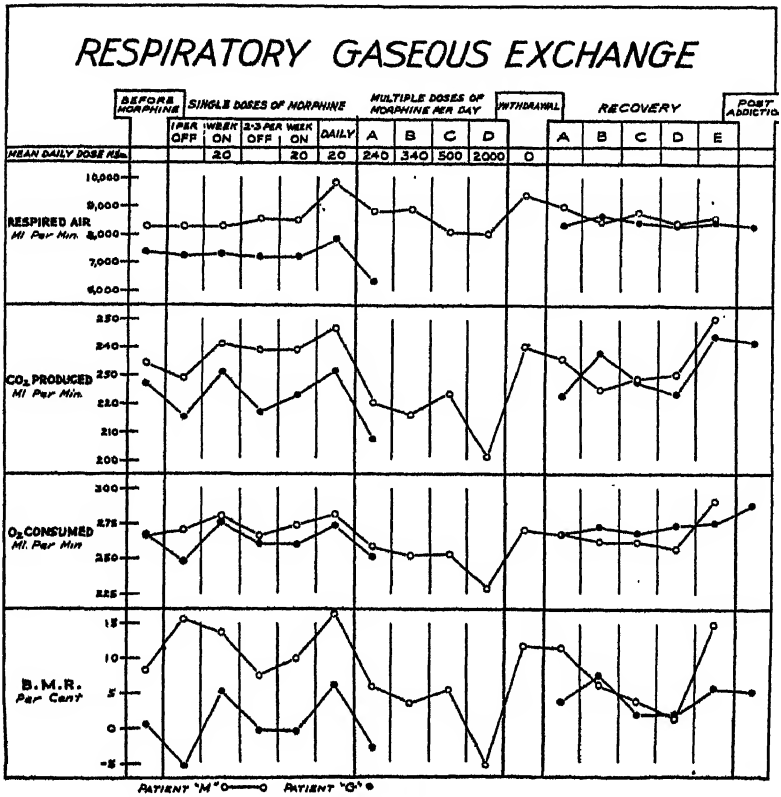

FIGURE 8.

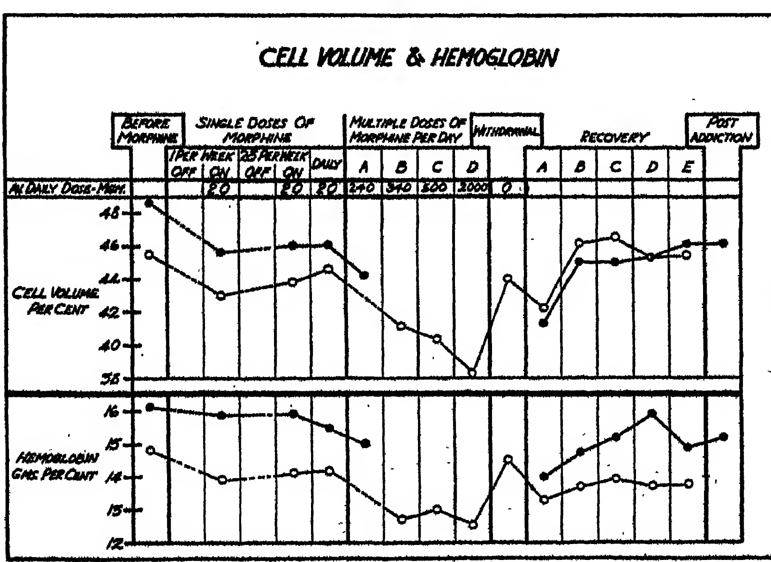

FIGURE 9.

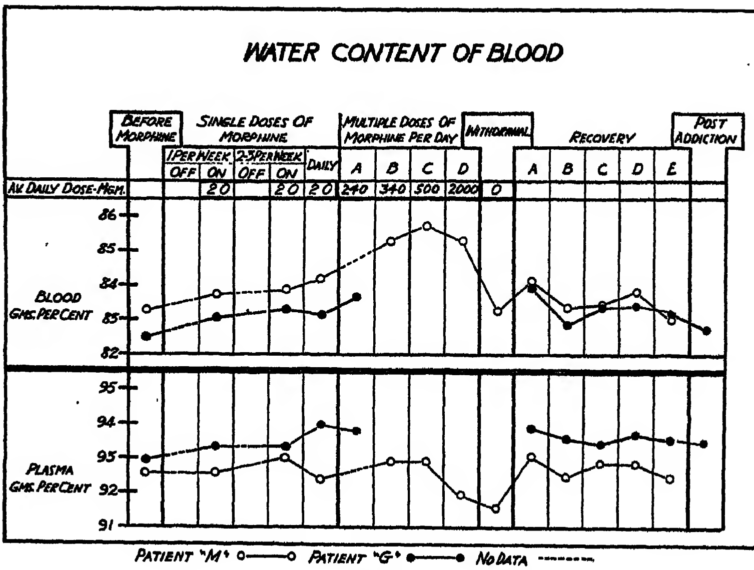

FIGURE 10.

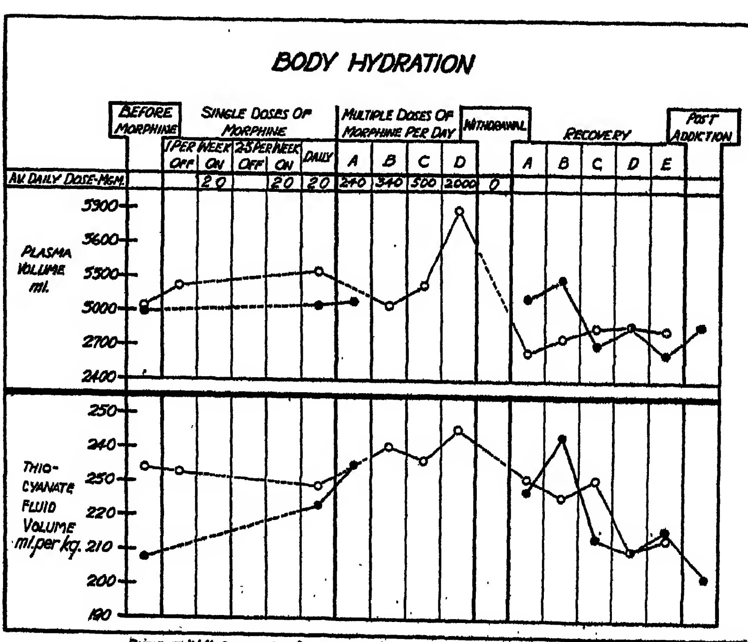

FIGURE 11.

water content of whole blood. No trends were noted in the other blood constituents analyzed. It is concluded that there is a tendency for blood to become slightly concentrated after a single dose of morphine, whether or not the subject is addicted.

NOTE: For purposes of completion, reference is made to two other studies which were made on these patients and which have been published. Excretion studies were reported by Oberst (*20*). Andrews (*21*) studied changes in cortical potentials and found that, before morphine, M regularly had an alpha index greater than 95 percent, whereas G had an index always below 10 percent. On morphine, M showed a decrease in alpha frequency and index. Tolerance to this effect was developed. G, on the other hand, showed an increase in both alpha index and frequency. On the assumption that G had a cortical excitatory state too great for alpha production (*22*) and that the excitatory state for M was almost optimum for alpha wave production, it was concluded that morphine addiction is associated with a depression in the cortical excitatory state (allowing alpha production in G and preventing it in M) and that tolerance to this effect can be developed. These effects appeared to be quite reversible, since records taken after withdrawal and recovery were practically identical with those of period I. This does not necessarily mean that the first cycle of addiction is accompanied by reversible changes.

DISCUSSION

This study represents a general survey rather than an intensive study on any particular aspect of addiction. The findings of apparent and significant changes in such a cycle of morphine addiction may serve as leads for more intensive studies.

Effects Produced by Repeated Doses of Morphine

The question was raised as to whether physical dependence would develop in patients receiving only single doses of morphine at regular intervals; first one per week, then two per week, three per week, and finally one per day. The 3-day withdrawal period following period II was designed to answer this question. Observations made during these 3 days (period III) were compared with the average values during daily single injections of period II. Many of the changes, though small, were in the same direction as those found during withdrawal in bona fide addicts. In addition to these, it was noted that the patients were unhappy, irritable, had a "let-down" feeling, and some rhinorrhea, lacrimation, and yawning. Scoring these observations by the point system of Himmelsbach (*3*) would yield very few or no points, yet it seems clearly evident that morphine had produced a low degree of physical dependence. It is believed that physical dependence effects occurred very early. It was noted that when the patients had been receiving two doses per week for about 3 weeks, they began to be irritable, showed increased psychomotor activity, yawned frequently, had slight rhinorrhea, and lacrimation the day before the next injection. They complained of being depressed, and pleaded

that the drug be given more frequently. After they were on three doses per week for several weeks, the same disturbance recurred until daily doses were instituted. These phenomena are being studied further.

This study adds little to our knowledge of tolerance. The question of increased nocturnal activity and development of tolerance thereto is being investigated further. Some tolerance was developed to the effects on cortical potentials (see note on page 21). After daily multiple doses were started it was only a matter of a few days before both patients were receiving 300 mg. of morphine per day without ill effects. After about 4½ months on 300 to 500 mg. per day, the dosage in one patient was increased to 4,440 mg. per day in the course of about 2 weeks. He was kept on the high dosage for only a few days because of the inconvenience of injecting such large quantities of fluid (12.7 cc., 5-percent solution, seven times daily). He was reasonably happy, carried on his usual routine activities, and ate and slept well. Five days before withdrawal the dosage was decreased from 4,440 to 1,750 mg. for 1 day and to 640 mg. per day for 4 days. There were no abstinence symptoms during this period. His withdrawal period was not unusual. The abstinence syndrome exhibited by him was comparable to that of an addict who had been stabilized on about 200 mg. of morphine per day.

Schmidt and Livingston (*23*) (quoting Light and Torrance) state that addicts tolerant to morphine administered subcutaneously are also tolerant to large doses given intravenously. This is undoubtedly true within the limits of their experiments, but the peculiar subjective and visibly objective effects of intravenously administered morphine are still present. These phenomena are flushing of the face, a tingling or pricking sensation "all over," and, in many instances, headache. These symptoms, except the headache, are fleeting and constitute the added "kick" sought by "main-line shooters." They may be alarming to the "skin shooter" who accidentally gets some of the drug into a vein. One of our patients, M, who had been receiving morphine for 4 months, and had been receiving 500 mg. daily for 20 days, suddenly appeared in the office in great fright, stating that some of his dose had gotten into a vein. His face was flushed and his trunk pale. He complained of a terrific headache. His blood pressure was not measured. He was reassured as to the harmlessness of the accident and in a few minutes the symptoms were gone, except the headache, which persisted for several hours.

Morphine usually depresses respiration. As a rule, complete tolerance is not developed to this effect and the rate remains subnormal during addiction. On the contrary, M showed an increased respiratory rate throughout periods II and IV.

Data in the literature on blood changes during addiction are limited.

In most instances little or no change has been reported. Williams (*24*) reported that addiction was associated with a lessened concentration of the blood. In this study his findings were corroborated in the following way: Hemoglobin and hematocrit readings were usually decreased and water content of the whole blood was increased during period IV. In addition to this blood hydration, the thiocyanate fluid volume was found to be increased during addiction. Together these findings imply an increased hydration of the body in general. That this might be a protective phenomenon is suggested by the reports from the literature (*25*) that dehydrated dogs, mice, and rats were more sensitive to morphine, and water loading made mice less sensitive. The question of body hydration and weight loss is being investigated further.

The findings on basal metabolic rate in this study are variable. However, there was a tendency toward a slight decrease during addiction, especially when the dosage was high. Heat production under basal conditions as determined from insensible water loss is in agreement with this. Himmelsbach (*26*) found only a slight decrease, if any, in B. M. R. in 21 patients during addiction.

There is a general notion that addicts prefer sweet foods. Observations on these two patients confirm this. The proportion of carbohydrates in their self-chosen diets was increased during addiction, largely at the expense of fats. The total caloric intake was not appreciably changed.

Effects of Single Doses of Morphine

Reports in the literature as reviewed by Krueger, Eddy, and Sumwalt (*25*) are somewhat conflicting as to the effects of morphine on the blood. The consensus, however, is that there is an increase in the hemoglobin content of peripheral blood and in the number of erythrocytes following morphine. In this study we found the blood to be slightly concentrated following single doses of morphine whether the individual was addicted or not.

Some investigators report an increase and others a decrease in blood pH after morphine. A biphasic action affecting pH has also been reported in which pH was first decreased and later increased. Probably the variability of the results may be attributed to such factors as differences in dosage, technique, and type of animal used. In the present study, blood was found to be slightly more alkaline following morphine.

The directional changes comprising the acute effects of morphine were unaltered throughout this study. That is to say, in no instance did we find that addiction had reversed the effect of morphine. However, the alterations which accompanied addiction were, in some instances, in the opposite direction to the acute effects of morphine

(single doses). For example, regardless of the state of addiction the blood was regularly slightly concentrated following a single injection, whereas during addiction it was hydrated with reference to the post-addiction values.

During withdrawal, as has been shown (*3*), caloric intake decreases especially from the second to the fourth day. Before morphine studies were started, the patients were studied for a period of 5 days during which the caloric intake was reduced by approximately the same amount as is observed during morphine withdrawal. No signs or symptoms comprising the morphine abstinence syndrome appeared during this time. It is therefore concluded that the clinical changes present during withdrawal are not due to a direct effect of reduced caloric intake.

SUMMARY

A longitudinal approach to the problem of drug addiction, using laboratory methods, was made on two post-addicts. Prior to any morphine injections, certain tests were made to establish norms for these patients. They were given 20-mg. doses of morphine sulfate subcutaneously, at weekly intervals, for a period of 2 months. During the next 6 weeks the frequency of the dosage was increased first to two, and then to three per week, after which the drug was administered daily for five weeks. It was then discontinued for 3 days and it was found that a slight but definite dependence had developed. Following this, morphine was given four times per day in increasing amounts. One patient was on this regimen for approximately 1 month and then permanently withdrawn. The other was given multiple doses of morphine daily for 6 months. The dosage was increased by arbitrary increments at intervals of 2 to 5 weeks. The highest dose was 4,440 mg. per day. The recovery period was divided into five parts to show progressive changes. The post-addiction period was arbitrarily chosen as beginning with the ninth month of abstinence.

An accurate account of carbohydrates, fat, protein, and water intake for each patient was made each day for periods of 6 days on alternate weeks. Urine and feces were analyzed for water during the corresponding periods.

Clinical observations, including temperature, blood pressure, pulse, and respiration were made three times daily. Nocturnal activity was determined by recording the number and magnitude of movements the patient made in bed from 11 p. m. to 5:30 a. m. Basal metabolism determinations were made from analyses of oxygen and carbon dioxide in expired air and from insensible weight loss.

Blood was analyzed approximately once a month for sodium, potassium, calcium, inorganic phosphorus, protein, carbon dioxide,

pH, specific gravity, water, hemoglobin, and cell volume. Body hydration was determined from plasma volume, thiocyanate fluid volume, water content of blood, hemoglobin, and packed cell volume.

The results of this study indicate that morphine addiction is accompanied by increases in: Body water, water content of blood, blood sedimentation, carbohydrate intake, and nocturnal activity; and by decreases in: Body weight, hemoglobin, packed cell volume, pulse rate, basal metabolism, and diastolic blood pressure.

In order to determine the "acute" effects of morphine, respired gaseous exchange, insensible weight loss, and blood constituents were studied before and after single doses of morphine at various times during the study. The minute volume of respired air, respiratory quotient, and insensible water loss were usually decreased after morphine, especially after large doses. Basal metabolic rate was decreased after large doses. Blood was found to be slightly more concentrated after morphine. There was no indication that addiction alters the action of the drug.

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DEATHS DURING WEEK ENDED DECEMBER 8, 1945

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 8, 1945	Corresponding week, 1944
Data for 93 large cities of the United States:		
Total deaths	9,945	9,343
Average for 3 prior years	9,752	
Total deaths, first 49 weeks of year	439,644	440,169
Deaths under 1 year of age	640	594
Average for 3 prior years	664	
Deaths under 1 year of age, first 49 weeks of year	29,714	30,302
Data from industrial insurance companies:		
Policies in force	67,264,229	66,920,488
Number of death claims	12,940	14,326
Death claims per 1,000 policies in force, annual rate	10.0	11.2
Death claims per 1,000 policies, first 49 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 15, 1945

Summary

A total of 148,688 cases of influenza was reported for the week, as compared with 49,694 last week, 2,924 and 82,951, respectively, for the corresponding weeks of 1944 and 1943, and 2,995 for the median of the corresponding weeks of the years 1940–44. Increases were reported in all of the 9 geographic divisions except the East North Central. Of the current total, 89,363 cases, or 60 percent, were reported in Kentucky, where last week 15,358 cases, or about 31 percent of the total occurred. An aggregate of 143,439 cases occurred in the 10 States reporting 1,000 or more cases each, in which 44,479 cases were reported last week. These States are as follows (last week's figures in parentheses): Kentucky 89,363 (15,358), Utah 17,023 (4,241), Texas 11,259 (7,332), Kansas 11,229 (6,848), Virginia 4,691 (3,993), West Virginia 3,808 (3,395), South Carolina 2,659 (2,459), North Dakota 1,244 (277), Arizona 1,163 (323), Georgia 1,000 (253). The total reported for the year to date is 309,422, as compared with 361,685 and 209,594, respectively, for the period in 1944 and 1943, and a 5-year median of 221,737. The total since July 1 is 242,948, as compared with 26,162 and 132,013, respectively, for the same periods in 1944 and 1943, and a 5-year median for that period of 30,099. The peak of incidence in the 1943–44 epidemic was reached in the first week of January, with a total of 126,610 cases reported for the week.

A total of 92 cases of meningococcus meningitis was reported (as compared with 118 last week), a smaller number than for the corresponding week of any of the past 3 years. The total for the year to date is 7,710, as compared with 15,689 for the corresponding period last year and a 5-year median of 3,495.

Of the total of 115 cases of poliomyelitis reported for the week, 56 occurred in 4 States—New York (16), California (15), Illinois (14), and Washington (11). The cumulative total is 13,558, as compared with 19,107 and 12,319 for the corresponding periods of 1944 and 1943, respectively, and a 5-year median of 9,685.

Deaths recorded for the week in 92 large cities of the United States aggregated 10,109, as compared with 9,840 last week, 9,292 for the corresponding week last year, and a 3-year (1942–44) average of 10,175. The cumulative total is 445,641, as compared with 445,311 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended December 15, 1945, and comparison with corresponding week of 1944 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that although none was reported, cases may have occurred.

Division and State	Diphtheria, Week ended— Dec. 15, 1945	Diphtheria, Week ended— Dec. 16, 1944	Diphtheria, Median 1940–44	Influenza, Week ended— Dec. 15, 1945	Influenza, Week ended— Dec. 16, 1944	Influenza, Median 1940–44	Measles, Week ended— Dec. 15, 1945	Measles, Week ended— Dec. 16, 1944	Measles, Median 1940–44	Meningitis, meningococcus, Week ended— Dec. 15, 1945	Meningitis, meningococcus, Week ended— Dec. 16, 1944	Meningitis, meningococcus, Median 1940–44
NEW ENGLAND												
Maine	5	0	0	3	-------	1	1	3	93	1	1	1
New Hampshire	0	0	0	149	-------	-------	34	1	2	0	0	0
Vermont	0	0	0	150	4	-------	5	4	4	0	0	0
Massachusetts	10	5	5	-------	-------	-------	152	58	245	3	7	6
Rhode Island	0	1	1	8	22	1	2	3	4	1	0	0
Connecticut	5	0	0	26	2	5	14	11	11	1	0	2
MIDDLE ATLANTIC												
New York	8	14	20	[1] 45	(1)	[1] 12	266	37	531	15	30	17
New Jersey	2	9	6	61	6	9	17	10	40	6	16	6
Pennsylvania	11	8	9	58	3	2	436	42	723	7	15	7
E. NORTH CENTRAL												
Ohio	24	9	11	86	10	13	10	12	53	4	12	3
Indiana	7	10	3	595	3	15	3	3	21	2	3	1
Illinois	8	4	16	56	5	10	214	34	83	7	13	6
Michigan [2]	11	22	6	6	1	9	229	19	86	3	9	3
Wisconsin	3	2	1	388	6	42	24	22	227	1	9	3
W. NORTH CENTRAL												
Minnesota	9	10	2	9	1	1	4	6	11	2	0	0
Iowa	10	8	3	65	-------	-------	6	13	44	0	0	0
Missouri	6	1	5	62	3	4	33	8	8	2	7	3
North Dakota	2	28	2	1,244	2	12	-------	-------	2	0	1	0
South Dakota	0	2	2	2	-------	-------	1	3	5	0	1	0
Nebraska	24	11	2	86	17	17	3	12	12	0	0	0
Kansas	7	10	4	11,229	4	16	41	7	50	0	2	2
SOUTH ATLANTIC												
Delaware	0	1	0	17	-------	-------	-------	4	4	0	0	0
Maryland [2]	16	5	5	59	2	9	9	1	11	3	6	6
District of Columbia	0	0	0	22	1	2	2	3	2	0	0	0
Virginia	9	4	11	4,691	208	233	64	11	94	4	3	3
West Virginia	3	5	5	3,808	8	27	1	22	22	1	0	2
North Carolina	36	14	17	-------	6	8	20	16	19	2	2	2
South Carolina	8	1	5	2,659	362	376	13	3	10	1	2	0
Georgia	19	13	13	1,000	58	80	12	21	21	0	1	1
Florida	11	4	8	8	1	11	4	3	3	0	4	1
E. SOUTH CENTRAL												
Kentucky	11	2	5	89,363	-------	13	211	-------	13	3	2	2
Tennessee	19	10	10	204	27	52	8	12	23	0	3	2
Alabama	25	14	17	640	53	98	2	1	35	4	1	1
Mississippi [2]	12	22	13	-------	-------	-------	-------	-------	-------	2	4	2
W. SOUTH CENTRAL												
Arkansas	13	5	7	644	57	150	14	5	23	3	2	1
Louisiana	22	10	9	47	3	3	7	5	4	1	1	1
Oklahoma	6	16	16	684	137	137	5	6	8	0	4	1
Texas	74	58	49	11,259	1,702	1,423	47	51	51	1	6	3
MOUNTAIN												
Montana	0	2	2	193	19	19	8	1	28	0	0	0
Idaho	0	0	0	279	1	1	73	-------	3	1	0	0
Wyoming	1	0	0	66	27	27	10	4	4	0	0	0
Colorado	7	5	5	367	4	42	12	9	154	0	3	1
New Mexico	0	2	2	8	2	2	1	-------	3	1	0	1
Arizona	7	2	2	1,163	109	110	2	5	21	0	2	0
Utah [2]	0	0	0	17,023	8	9	29	9	9	0	1	0
Nevada	0	0	0	-------	-------	-------	-------	1	1	0	0	0
PACIFIC												
Washington	5	35	7	-------	-------	12	220	34	34	1	3	3
Oregon	3	9	3	122	21	21	20	26	55	1	1	1
California	37	23	19	25	19	84	297	237	126	8	24	6
Total	496	416	393	148,688	2,924	2,995	2,581	798	4,779	92	201	108
50 weeks	17,768	13,434	14,995	309,422	361,685	221,737	123,670	600,848	587,903	7,710	15,689	3,495

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended December 15, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44
	Dec. 15, 1945	Dec. 16, 1944		Dec. 15, 1945	Dec. 16, 1944		Dec. 15, 1945	Dec. 16, 1944		Dec. 15, 1945	Dec. 16, 1944	
NEW ENGLAND												
Maine	1	0	0	24	52	12	0	0	0	0	1	1
New Hampshire	0	0	0	0	27	5	0	0	0	0	1	0
Vermont	1	0	0	10	5	2	0	0	0	0	0	0
Massachusetts	2	0	1	121	251	251	0	0	0	1	4	4
Rhode Island	1	0	0	12	22	10	0	0	0	0	0	0
Connecticut	1	0	0	29	55	45	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	16	27	8	296	333	301	0	0	0	2	5	5
New Jersey	0	2	1	46	88	88	0	0	0	1	1	1
Pennsylvania	0	1	1	174	250	226	0	0	0	2	0	5
EAST NORTH CENTRAL												
Ohio	2	4	2	326	318	250	0	0	0	2	0	2
Indiana	0	0	0	54	76	76	0	0	1	0	0	0
Illinois	14	1	2	145	268	207	0	0	0	1	2	2
Michigan [2]	3	4	1	209	189	185	0	0	1	3	1	3
Wisconsin	3	2	0	108	128	147	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota	0	1	1	42	60	76	0	0	0	0	0	0
Iowa	1	1	1	24	68	55	0	0	1	0	0	1
Missouri	7	1	1	59	70	59	0	0	0	1	0	1
North Dakota	0	1	0	8	24	14	0	1	0	0	0	0
South Dakota	1	0	0	4	16	20	0	0	0	0	1	0
Nebraska	0	15	1	22	56	36	0	0	0	0	0	0
Kansas	0	1	2	78	94	70	1	2	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	3	11	11	0	0	0	0	0	0
Maryland [2]	0	1	0	46	88	47	0	0	0	1	9	3
District of Columbia	0	1	0	13	49	14	0	0	0	0	2	1
Virginia	3	3	1	94	70	65	0	0	0	0	0	4
West Virginia	0	0	0	47	39	48	0	0	0	0	0	0
North Carolina	2	1	2	61	63	72	0	0	0	0	0	3
South Carolina	1	0	1	8	15	12	0	0	0	4	1	1
Georgia	0	2	0	32	32	32	0	0	0	1	5	4
Florida	3	1	1	8	8	7	0	0	0	3	1	2
EAST SOUTH CENTRAL												
Kentucky	2	2	2	65	72	72	0	1	1	1	0	4
Tennessee	0	0	0	35	89	60	0	0	0	0	2	2
Alabama	2	0	0	30	20	21	2	0	0	1	0	1
Mississippi [2]	3	0	1	35	23	11	1	0	0	1	2	1
WEST SOUTH CENTRAL												
Arkansas	0	2	1	18	17	11	0	0	0	8	1	1
Louisiana	8	0	0	23	21	7	0	2	1	5	3	3
Oklahoma	0	0	1	18	26	26	2	0	0	3	1	1
Texas	4	2	2	105	118	55	0	0	2	9	7	6
MOUNTAIN												
Montana	2	0	0	9	19	19	0	0	0	0	0	0
Idaho	0	0	0	13	27	15	0	0	0	1	0	1
Wyoming	0	1	0	7	12	8	0	0	0	0	0	0
Colorado	0	0	0	43	53	31	0	0	0	0	0	1
New Mexico	0	0	0	17	26	8	0	0	0	0	1	1
Arizona	1	0	1	15	7	7	0	0	0	1	2	1
Utah [2]	0	1	1	29	32	32	0	0	0	2	1	0
Nevada	0	0	0	0	5	1	0	0	0	0	0	0
PACIFIC												
Washington	11	4	3	38	87	37	0	0	0	1	0	0
Oregon	5	0	0	34	38	19	0	0	0	0	0	0
California	15	4	4	245	343	136	0	0	0	3	2	4
Total	115	86	85	2,882	3,860	3,100	6	6	11	53	56	72
50 weeks	13,558	19,107	9,685	167,781	183,195	134,742	339	377	764	4,773	5,302	6,603

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 1; South Carolina 2; Texas 1; California 3.

Telegraphic morbidity reports from State health officers for the week ended December 15, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Dec. 15, 1945	Whooping cough: Week ended— Dec. 16, 1944	Whooping cough: Median 1940–44	Week ended Dec. 15, 1945: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	40	33	33								1
New Hampshire	12	11	11								
Vermont	20	30	10								1
Massachusetts	164	100	199	3	4						3
Rhode Island	24	17	17								
Connecticut	58	98	80								5
MIDDLE ATLANTIC											
New York	286	286	403	5	87		1				4
New Jersey	184	118	152	2		2					2
Pennsylvania	129	116	216						2		
EAST NORTH CENTRAL											
Ohio	119	105	205		2						4
Indiana	15	3	14								
Illinois	76	70	162	4	1				9		2
Michigan [3]	211	71	232	3	2						1
Wisconsin	93	70	177								3
WEST NORTH CENTRAL											
Minnesota	7	20	28	2			1				2
Iowa	19	11	16								
Missouri	5	14	14						5		
North Dakota	3	5	11								1
South Dakota	2		3							1	
Nebraska	1	4	12								
Kansas	19	31	33						3		8
SOUTH ATLANTIC											
Delaware	5	4	6								
Maryland [3]	42	75	75						2		1
District of Columbia	5	3	10							1	
Virginia	43	76	76			27		1	2		
West Virginia	22	4	35								
North Carolina	46	89	117	1			1			3	
South Carolina	38	22	29	4	8					2	
Georgia	9	2	9		1	1				21	5
Florida	5	11	11	1	1					3	1
EAST SOUTH CENTRAL											
Kentucky	22	10	60						8		
Tennessee	9	10	23			1			2	4	1
Alabama	21	6	15							5	
Mississippi [3]									1	2	
WEST SOUTH CENTRAL											
Arkansas	6	14	17	1	4					2	1
Louisiana	2	2	4	2					1	16	1
Oklahoma	5	8	5								
Texas	139	177	145	20	317	91	1			14	9
MOUNTAIN											
Montana		14	14								
Idaho	10	3	3				1				1
Wyoming		8	6								
Colorado	14	10	31	1							
New Mexico		1	11		1	1					
Arizona	6	10	11			42					
Utah [3]	13	10	19								
Nevada											
PACIFIC											
Washington	49	17	64								1
Oregon	7	16	16								1
California	120	108	151	1	6		2		1	2	5
Total	2,125	1,923	3,360	50	434	165	7	1	36	76	64
Same week, 1944	1,923			31	523	230	3	0	55	135	77
Average, 1942–44	2,412			24	370	106	6	[4]0	34	[4]80	
50 weeks: 1945	120,814			1,885	24,069	10,371	612	466	765	5,046	4,733
1944	92,499			1,798	23,874	8,894	620	453	633	5,154	3,717
Average, 1942–44	146,379		[4]172,829	1,682	17,773	7,533	613	[4]451	754	[4]3,585	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1940–44.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 8, 1945

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	0	0	2	0	0	------
New Hampshire:												
Concord	0	0	------	0	------	0	3	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	1	0	------	0	6	1	1	3	26	0	1	26
Fall River	0	0	------	0	1	0	0	0	3	0	0	1
Springfield	0	0	------	0	1	0	0	0	3	0	0	6
Worcester	0	0	------	0	4	0	7	1	6	0	0	12
Rhode Island:												
Providence	0	0	------	0	------	1	2	0	3	0	1	30
Connecticut:												
Bridgeport	0	0	------	0	1	0	3	0	2	0	0	------
Hartford	0	0	------	0	2	0	0	0	0	0	0	7
New Haven	0	0	------	0	------	0	1	0	0	0	0	5
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	------	0	1	0	5	0	14	0	0	29
New York	9	1	5	2	61	7	64	4	99	0	3	77
Rochester	0	0	------	0	------	2	0	0	8	0	0	5
Syracuse	0	0	------	0	88	0	2	0	4	0	0	1
New Jersey:												
Camden	0	0	------	0	------	0	2	0	3	0	0	2
Newark	0	0	7	0	3	0	2	0	15	0	0	21
Trenton	0	0	1	0	------	0	3	1	0	0	0	3
Pennsylvania:												
Philadelphia	3	0	21	5	38	4	29	0	45	0	0	36
Pittsburgh	1	0	2	2	2	2	14	1	22	0	1	4
Reading	0	0	------	0	2	0	1	0	1	0	0	19
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	------	1	1	2	9	0	8	0	0	2
Cleveland	2	0	66	3	1	0	9	0	18	0	0	29
Columbus	3	0	1	1	1	0	1	0	10	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	------	0	1	0	0	0	0	------
Indianapolis	3	0	------	2	2	1	5	0	13	0	0	11
South Bend	0	0	------	0	------	0	0	0	0	0	0	------
Terre Haute	0	0	------	0	------	0	3	0	0	0	0	------
Illinois:												
Springfield	2	0	------	0	------	0	2	0	4	0	0	------
Michigan:												
Detroit	5	0	------	0	55	1	14	0	41	0	1	99
Flint	0	0	------	0	7	0	3	0	3	0	0	4
Grand Rapids	0	0	------	0	4	0	0	0	3	0	0	5
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	0	0	0	------
Milwaukee	0	0	------	0	1	2	10	0	28	0	0	24
Racine	0	0	------	0	------	0	0	0	1	0	0	------
Superior	0	0	------	0	1	0	0	0	0	0	0	9
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	------	0	3	0	2	0	0	4
Minneapolis	1	0	------	0	1	0	8	0	8	0	0	1
St. Paul	1	0	------	0	------	1	0	0	9	0	0	4
Missouri:												
Kansas City	0	0	3	0	23	0	8	0	13	0	0	1
St. Joseph	1	0	------	0	30	0	0	0	3	0	0	------
St. Louis	2	0	21	0	1	0	12	4	13	0	0	1

City reports for week ended December 8, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	1	0	------	0	2	0	1	0	1	0	0	------
Nebraska:												
Omaha	0	0	------	3	2	0	1	0	13	0	0	------
Kansas:												
Topeka	1	0	------	0	2	0	0	0	4	0	0	1
Wichita	0	0	1	0	------	0	2	0	10	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	1	0	1	0	0	0	0	------
Maryland:												
Baltimore	7	0	17	1	2	1	7	0	22	0	0	17
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	1	0	3	0	1	1	9	2	20	0	0	5
Virginia:												
Richmond	0	0	------	0	1	0	5	1	11	0	0	------
Roanoke	0	0	------	0	------	0	1	0	0	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	------	0	1	0	0	0	0	------
North Carolina:												
Raleigh	0	0	------	0	------	0	1	0	0	0	0	------
Wilmington	1	0	------	0	------	0	0	0	3	0	0	------
Winston-Salem	1	0	------	0	------	0	4	0	1	0	0	1
South Carolina:												
Charleston	0	0	52	2	1	0	0	0	0	0	0	------
Georgia:												
Atlanta	0	0	60	2	------	0	1	0	3	0	0	------
Brunswick	0	0	------	0	------	0	0	0	1	0	0	------
Savannah	0	0	------	0	------	0	0	0	5	0	0	------
Florida:												
Tampa	1	0	------	0	------	0	2	0	4	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	15	0	------	0	9	1	4	0	0	11
Nashville	0	0	------	2	4	0	5	0	2	0	0	------
Alabama:												
Birmingham	2	0	13	1	------	0	4	0	4	0	0	------
Mobile	0	0	2	1	------	1	2	1	1	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	------	0	2	0	1	0	0	------
Louisiana:												
New Orleans	4	0	3	3	1	1	3	3	10	0	0	1
Shreveport	1	0	------	0	------	0	5	1	1	0	0	------
Texas:												
Dallas	0	0	2	2	------	0	3	0	7	0	1	1
Galveston	1	0	------	0	------	0	0	0	1	0	0	------
Houston	1	0	------	0	------	0	7	0	7	0	0	------
San Antonio	2	0	1	0	------	0	2	0	1	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	1	------	0	0	0	0	0	0	------
Great Falls	0	0	------	0	------	1	1	0	1	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	0	0	2	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	0	0	0	0	0	------
Colorado:												
Pueblo	0	0	------	0	------	0	2	0	3	0	0	------
Utah:												
Salt Lake City	0	0	------	0	7	0	0	0	5	0	0	1

City reports for week ended December 8, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Spokane	0	0	------	0	10	1	0	0	1	0	0	7
Tacoma	0	0	------	0	58	0	0	1	0	0	0	11
California:												
Los Angeles	2	0	16	0	12	2	6	3	29	0	0	19
Sacramento	0	0	------	0	12	0	3	1	2	0	0	1
San Francisco	0	0	1	0	57	0	9	6	14	0	0	4
Total	64	1	313	34	511	32	326	34	627	0	8	558
Corresponding week, 1944	88	------	93	39	182	------	372	------	950	0	9	554
Average, 1940-44	71	------	1,195	[1] 64	[2] 1,025	------	[1] 467	------	791	2	14	810

[1] 3-year average, 1942-44.
[2] 5-year median, 1940-44.

Dysentery, bacillary.—Cases: Providence 1; New York 9; Charleston, S. C. 1; Los Angeles 2.
Dysentery, unspecified.—Cases: San Antonio 13.
Rocky Mountain spotted fever.—Cases: Nashville 1.
Tularemia.—Cases: St. Louis 1; Missoula 1.
Typhus fever, endemic.—Cases: Atlanta 5; Savannah 5; Tampa 1; Nashville 2; Birmingham 1; Mobile 2; New Orleans 5; Houston 3.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1934, 31,208,900)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	2.6	0.0	0.0	0.0	30	5.2	44.4	10.5	118	0.0	5.2	227
Middle Atlantic	7.4	0.5	16.7	4.2	90	6.9	56.5	2.8	98	0.0	1.9	91
East North Central	12.5	0.0	56.0	5.8	61	5.0	47.6	0.0	108	0.0	0.8	153
West North Central	13.9	0.0	40.7	6.0	121	2.0	69.6	8.0	151	0.0	0.0	24
South Atlantic	18.4	0.0	221.0	8.4	10	3.3	53.6	5.0	117	0.0	0.0	39
East South Central	17.7	0.0	177.1	23.6	24	5.9	118.0	11.8	65	0.0	0.0	65
West South Central	25.8	0.0	17.2	14.3	3	2.9	63.1	11.5	80	0.0	2.9	6
Mountain	0.0	0.0	0.0	16.3	114	16.3	48.8	0.0	179	0.0	0.0	16
Pacific	3.6	0.0	31.0	0.0	271	5.5	32.8	20.0	84	0.0	0.0	76
Total	10.7	0.2	52.4	5.7	86	5.4	54.6	5.7	105	0.0	1.3	93

TERRITORIES AND POSSESSIONS

Puerto Rico

Notifiable diseases—4 weeks ended December 1, 1945.—During the 4 weeks ended December 1, 1945, cases of certain notifiable diseases were reported in Puerto Rico as follows:

Disease	Cases	Disease	Cases
Bilharziasis	6	Mumps	3
Chickenpox	2	Puerperal fever	1
Diphtheria	32	Syphilis	364
Dysentery, unspecified	6	Tetanus	6
Erysipelas	4	Tetanus, infantile	1
Filariasis	2	Tuberculosis (all forms)	512
German measles	3	Typhoid and paratyphoid fever	22
Gonorrhea	162	Typhus fever (murine)	
Influenza	305	Undulant fever	
Malaria	580	Whooping cough	
Measles	29		

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 17, 1945.—During the week ended November 17, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		14	3	179	286	63	40	77	119	781
Diphtheria		3	3	59	16	4		2		87
Dysentery:										
Amebic					1					1
Bacillary				1						1
German measles				6	10		1	6	3	26
Influenza		1			11					12
Measles		1	71	235	331	1	13	6	58	716
Meningitis, meningococcus				1		1	2			4
Mumps			3	71	108	15	1	49	21	268
Poliomyelitis				2	1		1			4
Scarlet fever		15	15	168	79	11	6	15	19	328
Tuberculosis (all forms)		4	17	126	51	20	7	4	37	275
Typhoid and paratyphoid fever			2	12	9				2	25
Undulant fever				3	2			1		6
Venereal diseases:										
Gonorrhea		22	26	114	180	54	40	32	110	578
Syphilis		4	3	138	141	18	9	30	42	385
Other forms				1						1
Whooping cough		3		150	36	8	4	9		210

FINLAND

Notifiable diseases—October 1945.—During the month of October 1945, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	9	Mumps	288
Chickenpox	858	Paratyphoid fever	584
Conjunctivitis	43	Pneumonia (all forms)	1,529
Diphtheria	1,823	Poliomyelitis	120
Dysentery, unspecified	31	Puerperal fever	55
Gastroenteritis	3,382	Rheumatic fever	386
Gonorrhea	2,057	Scabies	6,271
Hepatitis, epidemic	1,226	Scarlet fever	327
Influenza	586	Syphilis	618
Laryngitis	69	Typhoid fever	82
Malaria	12	Vincent's angina	54
Measles	48	Whooping cough	1,088

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Italy—Taranto.—For the week ended November 24, 1945, 2 cases of plague with 1 death were reported in Taranto, Italy.

Peru.—For the month of October 1945, plague was reported in Peru by Departments as follows: Ancash—Bolognesi Province, 3 cases, 1 death; Santa Province, 1 case; Lima—Chancay Province, 2 cases, including 1 case in the city of Huacho.

Smallpox

Belgian Congo.—For the week ended November 17, 1945, 75 cases of smallpox (alastrim) were reported in Belgian Congo.

Sudan (French).—Smallpox has been reported in French Sudan as follows: November 1–10, 1945, 26 cases; November 11–20, 1945, 83 cases.

Typhus Fever

Belgian Congo.—For the week ended November 17, 1945, 104 cases of typhus fever (murine type) were reported in Belgian Congo.

Turkey.—For the week ended December 1, 1945, 38 cases of typhus fever were reported in Turkey, including 10 cases in Istanbul and 4 cases in Izmir.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROT, *Chief of Division*

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Public Health Reports

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Public Health Reports

Vol. 61 • JANUARY 11, 1946 • *No. 2*

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A CYCLE OF MORPHINE ADDICTION

BIOLOGICAL AND PSYCHOLOGICAL STUDIES [1]

Part II: Psychological Investigations [2]

By Ralph R. Brown, *Psychologist, United States Public Health Service*

CONTENTS

INTRODUCTION

The following study represents an effort to determine whether certain psychological and psychophysiological phenomena are changed with morphine or with morphine addiction in man. There are significant differences between man and the higher animals with reference to the effects of morphine, morphine addiction, withdrawal phenomena, and the desire for morphine following withdrawal of the drug (*1*). Spragg (*2*) reports that the chimpanzee shows no active desire for morphine 2 weeks after withdrawal. When considered in the light of the human addict's tendency to relapse to the use of morphine after months or years of abstinence, it becomes apparent that there are significant problems in the field of addiction which must be studied in the human.

Experiments have been conducted on the effects of single injections of morphine on such functions as simple reaction time (*3, 4, 5*), eye-hand coordination and memory (*6*), sensory thresholds and suggesti-

[1] From the Division of Mental Hygiene, Bureau of Medical Services (Department of Research, U. S. Public Health Service Hospital, Lexington, Ky.)

[2] Part I: Biological Investigations, By Edwin G. Williams, Senior Surgeon, and Fred W. Oberst, Biological Chemist, was published in Public Health Reports 61: 1-26. (Jan. 4, 1946). (The two parts of this article will be combined in one reprint.)

bility (*7*). A study of suggestibility in addicted and nonaddicted human subjects has been reported (*8*). No literature is available, however, on the effects of repeated injections of morphine upon these functions. An effort has been made in the present study to secure data bearing on the problem of mental efficiency in its relation to addiction, and for this purpose a wide sampling of tests has been employed, ranging from simple sensory and motor tests to complex tests of learning.

The effects of morphine and morphine addiction upon physiological reactions to psychological stimulation were undertaken because of the role which the emotions may play in the etiology of addiction. Inasmuch as the nature of the study required observations over a 2-year period, the plan of the experiment was handicapped by the fact that no studies have been reported in which measurements of emotional reactions have been made over such an extended period of time. The fact that emotional stimuli do not remain psychologically equivalent from one experimental period to the next raised the question as to the advisability of making frequent measurements during the course of the experiment with the hope of being able to correct for the effects of adaptation, or limiting the experimental trials to a single experiment before, during, and following addiction. The former plan was adopted, with the modification that different sets of word stimuli were used so that repetition of identical experiments would not occur until the lapse of at least 3 months. This allowed for a considerable number of experiments under various conditions.

The ideal subjects for study of this nature would, of course, be those who have had no former experience with opium or any of its derivatives. The possible social consequences of this kind of experimentation, however, rule against the use of subjects unfamiliar with morphine. The extent to which this condition restricts the significance of the findings is difficult to estimate. From the standpoint of the sociological problem of drug addiction, the use of post-addicts as subjects has some advantage over the use of subjects who have not demonstrated a strong desire for morphine.

APPARATUS

The following major pieces of apparatus were used in connection with this study.

The Darrow photopolygraph.—This apparatus gives a simultaneous recording of blood pressure changes (relative), pulse rate, respiration, skin resistance (conductance), tremor, voice- and hand-reaction time, and time of stimulus (*9*).

Apparatus for testing finger sensitivity to electric current.—This consisted of a thermal milliameter (range 0–2 milliamperes), two 45-volt

B batteries, voltmeter, two 200,000-ohm variable resistors, finger electrodes, and pan (15 inches long by 11 inches wide by 2½ inches deep) containing 2 liters of tap water for use as a physiologically inactive electrode. The finger electrode consisted of a round-headed brass machine screw (⅜-inch diameter) covered with chamois skin, which was attached to a lever having a spring for controlling pressure of the electrode on the finger. Direct current readings were taken. Skin resistance was calculated on the basis of known applied voltage and current as measured by the milliameter.

Apparatus for measuring steadiness.—This apparatus consisted of a long glass tube through which water flowed at the rate of 567 cc. per minute from a 10-gallon tank. The tube was held by the subject who was told to direct the stream of water into the small end of a funnel, the amount of water collected in a given time being taken as an indication of motor control. Diameter of the funnel opening was 7 millimeters. The subject stood at a distance of 1.5 meters from the funnel opening with the end of the tube held 8 cm. from the hole.

Apparatus for measuring tapping speed.—A Veeder counter was attached to hand rest which was constructed so as to immobilize all but the index finger which was left free for tapping.

TESTS

The following tests were used routinely throughout the study.

Word association tests.—These tests were used with the subject attached to the Darrow photopolygraph. Each set contained nine arbitrarily indifferent and nine disturbing words plus the introductory word "green." Each word, printed on a 5- x 8-inch card, was presented visually by means of a falling shutter arrangement which was electrically controlled. Twenty different sets of words were used. The subjects were requested to respond verbally with the first word coming to mind after presentation of the stimulus, at the same time depressing the right-hand tremograph key. The disturbing stimuli were divided into sex, crime, and drug words. Only one set of words was used at any experimental session.

Code learning test (Johnson).—Twenty-four different forms of this test were constructed, one of which is presented below:

Code

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
D Z H K P Q C A R V G O F Y E W X J L B M S I T U N

Test Material

Q T H O X E G C A Y P M K Z V W R B J M S F D U L I X O J T
M A G K U P B S W Q Z E I N Y V L E C F

Answer

X	B	A	E	T	P	C	H	D	U

In the sample shown above, the first series of letters has been placed in the squares as would be required of the subject. The subject was expected to transpose each of the series of letters into the proper squares. No attempt was made to equalize the difficulty of the forms of the test. It was found, however, that the monthly variability was less than that observed on any of the other measures. Score was the average time required to do one line of code.

Recognition of nonsense syllables.—Ten nonsense syllables were presented one at a time at 5-second intervals. Immediately after this initial presentation, a set of 20 syllables was presented, among which were the original 10. The subjects were requested to indicate which of these syllables were originally presented. The 20 cards were again presented 6 hours later with the same instructions, and this was called delayed recognition.

Delayed recognition.—Score was the number of syllables recognized. Twelve different forms of this test were used.

Oscillation (Scripture's blocks).—The subjects looked at the blocks for 2 minutes during which time they recorded each change in perspective on a Veeder counter.

Continuous subtraction.—The subjects were required to perform repeated subtraction of 13 from an initial number chosen from a range of 200 to 212. Time and errors were recorded.

PROCEDURE

The routine tests were arranged into four batteries, each battery being administered at predetermined periods throughout the study. With the exception of the first month, tests were given every other week. The intervening week was devoted to physiological investigations.

Battery X.—This battery included measures of finger sensitivity to electric current, steadiness, and code learning. About 50 minutes were required for its completion. The procedure in administration was as follows. The subject was first tested for sensitivity of the middle and ring fingers (right hand) to electric current. He sat in a chair with his back to the observer, his middle finger placed under the

electrode, with the right foot in the pan containing tap water. Starting at a very low level of intensity, brief electrical stimulations were administered at intervals of from 3 to 5 seconds, the intensity being increased at each succeeding stimulation until the subject consistently reported feeling the current. The intensity was then gradually decreased in steps of less than 0.05 milliamperes until the subject no longer reported the sensation. The median of three readings (midpoint between the appearance and disappearance of sensation) was taken as the sensitivity threshold. The middle and fourth fingers were tested alternately. Oral temperature was then taken (5 minutes) during the last minute of which pulse rate was counted. The code-learning test was administered, requiring approximately 5 minutes, immediately following which pulse and temperature were taken again. This battery of tests was administered at 8 a. m., 10 a. m., and 2 p. m. on Mondays, and at 9 a. m., 11 a. m., and 3 p. m. on Thursdays. A different code-learning test was used each time until the series of 24 tests was completed, after which the series was repeated.

Battery Y.—This battery consisted of a word-association test. The patient sat in a comfortable armchair with the fingers of each hand inserted in the tremograph. The Darrow electrodes were attached to the left wrist and palm, Redux paste being used on the wrists to eliminate resistance from that area. The blood-pressure cuff was attached to the left arm and the voice key was placed near the subject's mouth. In order to avoid discomfort, it was found necessary to maintain the cuff pressure at approximately 50 mm. of mercury. (In our experience the recommended pressure of one-third of the way from the diastolic to the systolic level is uncomfortable.) Tests were made at 8 or 9 a. m. (alternately) and at 2 or 3 p. m. (alternately) on Wednesday of every other week. A different association test was used at each sitting until the series was completed. This required approximately 4½ months, after which the words were repeated. The battery required about 45 minutes. Blood pressure was taken before and after each experiment.

Battery Z.—This battery included measurements of steadiness and tapping speed. In the steadiness tests two trials of 1½ minutes each were made with an intervening rest period of 3 minutes. Score was the amount of water directed into the bottle in 1½ minutes (average of the two trials). After completion of this test, tapping speed was studied. The subject was required to tap on a Veeder counter with his index finger as rapidly as possible for 10 seconds. Nine trials were made with a rest of 1½ minutes after each trial. Score was the median of the nine trials in terms of taps per 10 seconds. Pulse and temperature were taken before and immediately following the tapping speed experiment. This battery was administered at 8 a. m. and 2 p. m. on Tuesdays, and at 9 a. m. and 3 p. m. on Fridays.

Battery M.—This battery included tests of immediate and delayed recognition of nonsense syllables, oscillation, and continuous subtraction. Battery M was given on Fridays immediately following battery Z.

RESULTS

ROUTINE SENSORY, PSYCHOMOTOR, MEMORY, AND LEARNING TESTS

General Remarks

By the time morphine injections were begun the patients had become well-accustomed to the experimental routine. At no time did they appear to lose interest in the experiment, nor was the examiner able to notice any lack of cooperation during any phase of the study.

Attention has been directed (part I) to the personality differences between the patients and to their antagonistic rivalry. This antagonism was less noticeable during the early stages of addiction, but reappeared after 3 or 4 weeks of morphine administration. During the single injection and early addiction phase it appeared that the morphine was producing feelings of elation in both subjects, more noticeable in M. It should be emphasized, however, that the effects of the drug upon gross behavior were much less than that generally reported for medium or large doses of alcohol. The elation was manifested by increased talkativeness, sociability, and a somewhat increased psychomotor activity, but these factors were seldom of sufficient magnitude to be noticed by anyone not familiar with the subjects' usual emotional tone.

As the injections were increased in frequency and amount, the patients apparently would be satisfied a few days after each increase in dosage, [3] but seldom was there a dosage level which maintained satisfaction for a period longer than 3 weeks. There was no indication from the spontaneous behavior of these patients that morphine had increased the feeling tone in the direction of pleasantness. Short periods of euphoria seemed to occur, but the general level of mood during the addiction period was in the direction of unpleasantness.

Finger Sensitivity

The sensitivity readings on the middle and ring fingers are shown in the two upper sections of figure 1. Each bar represents the monthly average (approximately 27 readings) expressed in terms of milliamperes. From November 1938 to February 1939, during which

[3] Dosage schedule: In order to establish norms and to observe their general behavior, the patients were studied for several months before morphine was administered. They were then given single doses (20 mg.) of morphine sulfate once weekly for 2 months. During the following 6 weeks the number of doses was increased, first to two and then to three injections per week, after which the drug was administered in single daily doses for 5 weeks. At the end of the daily single-dosage period, the drug was withheld for 3 days to determine whether physical dependence had developed. It was then given four times per day in increasing amounts, reaching 800 mg. per day by the seventeenth day, the highest dose being 4,440 mg. per day for 3 days just before the drug was discontinued.

period the effects of single injections were being studied, the bars have been separated to show the levels on morphine days. The figures below these months indicate the number of single injections which were being given each week during this period. It may be noted that

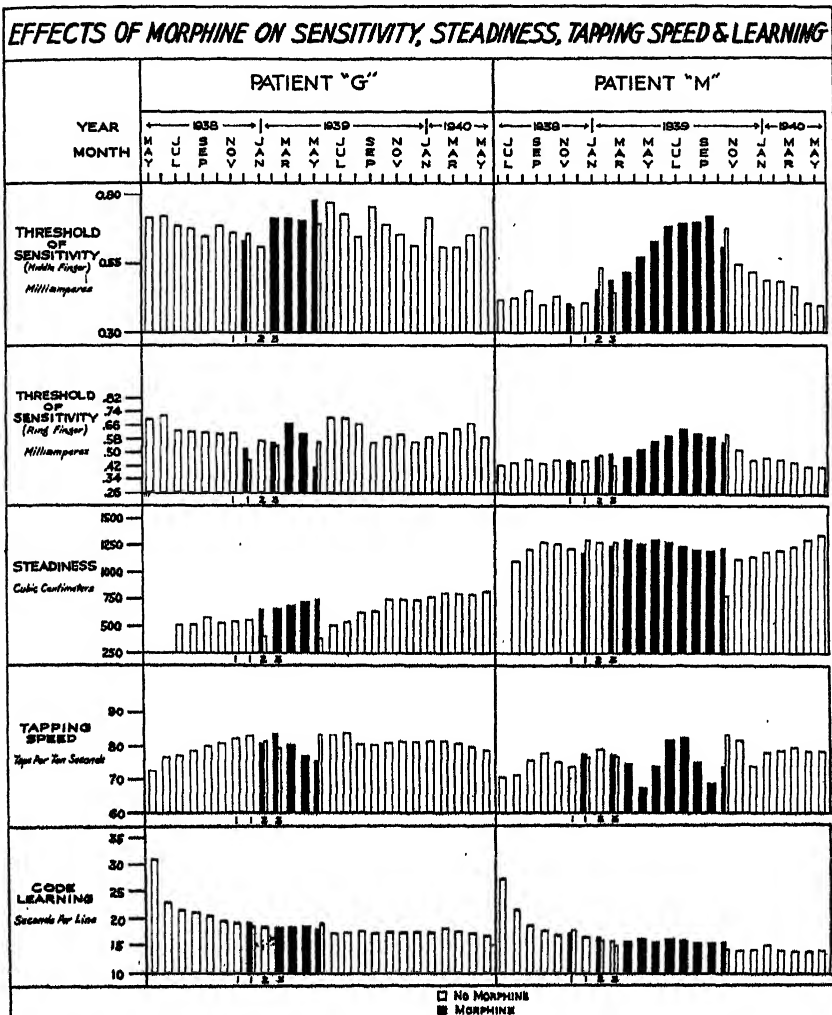

Figure 1.

G showed fluctuations in the monthly averages following morphine administration.

Finger sensitivity during the pre-addiction period for M was somewhat irregular and no significant effects of morphine were noted during the period of one injection per week. There was a rise in sensitivity when two injections were given per week, with the larger

rise occurring on the nonmorphine days. During the period in which three injections were given per week this relationship was reversed. As addiction proceeded, sensitivity became less, i. e., the threshold was increased. The highest threshold was in July for the ring finger and in September for the middle finger. Coefficients of correlation between the middle and ring fingers on this patient were 0.73 for the pre-addiction period, 0.88 for early addiction, 0.67 for late addiction, and 0.76 for the recovery period. After 6 months the original level was regained.

Steadiness

Changes in steadiness are shown in the middle section of figure 1. G, who was inferior to M with respect to this function, showed an improvement in steadiness following morphine injections, with the improvement continuing during each month of addiction. Withdrawal was associated with a marked drop in steadiness which was followed by a gradual rise to a plateau 5½ months after withdrawal. This plateau was slightly above the highest level reached during the addiction period. M showed a gradual increase in steadiness to an initial peak in September of 1938. During the single-injection period it appeared that steadiness was better on the nonmorphine days. During the latter part of addiction, motor control appeared to be somewhat diminished, with a sudden drop to an extremely low level 1 week following withdrawal. As recovery proceeded there was gradual improvement. There is no indication of a plateau having been reached at the end of 7 months.

Tapping Speed

The monthly averages for tapping speed in terms of taps per 10 seconds are also shown in figure 1. G showed a gradual improvement in tapping speed from 73 taps per 10 seconds in May to 83 taps per 10 seconds in December, the month just preceding the start of the morphine injections. After dropping to 81 the following month, a peak of 84 was reached, after which there was a gradual decline to 75 taps per 10 seconds during the last month of addiction. After withdrawal, the rate went to 83 and this level was maintained for 2½ months, after which the performance leveled off at approximately 80 taps per 10 seconds. At no time during 12 months following withdrawal did the performance drop to the level which obtained during the last 2 months of addiction.

M showed much more variability in this function than did G, especially during the addiction period. Two of the monthly averages in the addiction period were lower than any average obtained before or after addiction. Two other addiction averages were higher than the general level of performance. During the last addiction month

the level was 74 and there was an increase to 83 taps per 10 seconds 1 week after withdrawal of the drug. This figure was the highest obtained by the patient during the entire course of the experiment. There was a drop to 74 taps per 10 seconds 2½ months after withdrawal, after which the performance leveled off at approximately 79, with variations from 78 to 80 in the next 5 months.

Code Learning

Performance on the Johnson code-learning test is shown in figure 1. The values represented here are the monthly averages (approximately 27 experimental runs per month) in terms of seconds required to transpose one line of code. Although, in this test, neither of the subjects showed marked changes associated with morphine, G's improvement was arrested, and M showed a lower level of performance during the administration of morphine.

Continuous Subtraction

The performance of this test is presented in terms of monthly averages (four tests per month) in table 1. The monthly variability in performance was too great to allow for adequate interpretation of the averages obtained during the addiction period. The fact that M reached his peak performance 1 week after withdrawal of morphine may, however, be significant. G equaled his highest previous average during the withdrawal period, but this level was only slightly superior to the highest addiction average.

With reference to the average number of errors in continuous subtraction (table 1), the irregularities of the data obscure any trends which might exist. It may be noted, however, that if we omit the first month of the experiment for G, both patients showed the greatest number of errors during the last month of morphine.

Scripture's Block Oscillations

The number of alterations during the 2-minute period is presented as monthly averages (four readings per month) in table 1. No clear-cut trends can be noted for either subject.

Immediate and Delayed Recall of Nonsense Syllables

As may be noted from table 1, the changes in immediate and delayed recall are of insufficient magnitude in any particular direction to warrant conclusions with reference to the effects of morphine or morphine addiction on this function.

ANALYSIS OF PSYCHOPHYSIOLOGICAL DATA OBTAINED FROM WORD STIMULI

Introductory Remarks

The use of physiological functions as indices of psychological disturbances necessitates preliminary analysis to determine the psychological significance of the functions employed. It was not

TABLE 1.—*Results from tests in battery M*

Tests	Experimental conditions	1938						1939												1940				
		July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May
Continuous subtraction (seconds).	G																							
	Morphine							38		45	37	44												
	No morphine	82	57	57	60	50	40	43	40			36	45	35	48	37	34	31	31	30	28	41	28	33
	M																							
	Morphine						18		23	28	25	21	20	18	32	18	23							
	No morphine	25	38	35	30	29	21	23	22								16	28	22	20	25	22	18	18
Continuous subtraction (errors).	G																							
	Morphine							0.0		0.0	0.5	3.0												
	No morphine	4.0	1.6	1.3	1.5	1.5	2.0	0.0	0.0			1.0	1.0	0.0	1.5	0.5	0.0	1.0	1.7	1.0	1.5	2.0	2.0	1.0
	M																							
	Morphine						1.0		3.0	0.3	0.0	0.5	0.0	0.0	0.5	1.7	4.0							
	No morphine	3.0	0.0	0.5	1.3	0.5	0.0	0.0	0.0								2.0	1.0	0.5	1.0	0.0	1.0	1.5	3.0
Scripture block oscillations in 2 minutes.	G																							
	Morphine							53		72	58	67												
	No morphine	29	42	45	39	58	.62	53	50			66	68	66	59	55	60	55	64	70	66	55	55	52
	M																							
	Morphine						46		42	42	39	39	44	41	47	35	45							
	No morphine	44	32	38	29	43	37	47	45								52	43	41	30	53	40	47	36
Immediate recall of nonsense syllables (syllables recognized).	G																							
	Morphine							19		18	17	15												
	No morphine	13	17	17	18	15	18	20	17			17	18	19	17	18	16	18	19	19	18	19	15	19
	M																							
	Morphine						18		15	17	17	17	17	19	18	19	14							
	No morphine	12	17	17	15	15	17	19	15								17	18	20	17	18	18	18	17
Delayed recall of nonsense syllables (syllables recognized).	G																							
	Morphine							15		15	11	13												
	No morphine	12	13	15	16	13	13	17	15			11	14	17	13	16	14	15	17	17	15	15	14	15
	M																							
	Morphine						13		13	14	16	15	18	16	15	16	16							
	No morphine	14	15	14	16	13	14	19	15								16	16	19	15	15	17	16	17

reasonable to assume that all or any of the functions measured by the Darrow photopolygraph could be accepted as valid indicators of psychological disturbance. Therefore it was necessary to determine the relative differences among these functions with reference to their discriminatory values.

The response difference between indifferent and disturbing words, or the response to a combination of indifferent and disturbing words, was taken as an indicator of the psychological significance of the physiological function under consideration. A lack of differential response does not necessarily indicate the inadequacy of a physiological variable as an indicator of psychological disturbance, since such a failure to differentiate may be caused by an inadequate choice of disturbing and nondisturbing words. In the case of positive and significant differences between responses to indifferent and disturbing words, however, it is reasonable to assume that the physiological function concerned is being affected by psychological factors, since only differences in meaning between the two sets of words could account logically for differences in physiological response.

Statistically significant differences (critical ratio of three or above) between the indifferent and disturbing words were found for conductance change, expiration time, time for five breaths as a percent of final rest, and voice-response time for both patients. Conductance recovery ratio, inspiration time, and hand-response time gave statistically significant differences between the indifferent and disturbing words for M, but not for G. Pulse rate, blood pressure, and amplitude of respiration did not show significant differences in either G or M.

Voice-Response Time

The effects of morphine on the voice-response time to the word stimuli (indifferent and disturbing words combined) are shown in figure 2. Each bar in this graph represents the average voice-response time for 1 month (usually four records, each record consisting of 19 stimuli). Records taken on those days on which morphine was administered are shown in solid color. The numbers under the bars represent the number of the injections which were being given per week during these periods. Recordings of this function, as well as that of hand response time, were not obtained until the beginning of December 1938. It may be noted from the graph that G showed an increase in time of response during the last 1½ months of addiction. Upon withdrawal there was a decrease in time of response, which was maintained below the average found during the last 1½ months of addiction.

In M, morphine appeared to increase the time of voice response during the single injection period. There was some decrease during the early stages of addiction. As addiction progressed, however, the

time of voice response increased. Upon withdrawal of the drug there was a significant drop and this level was consistently maintained during the remaining 7 months of the study.

Figure 3 shows that the differential response to disturbing and non-disturbing words was less under morphine than under comparable nonmorphine experiments.

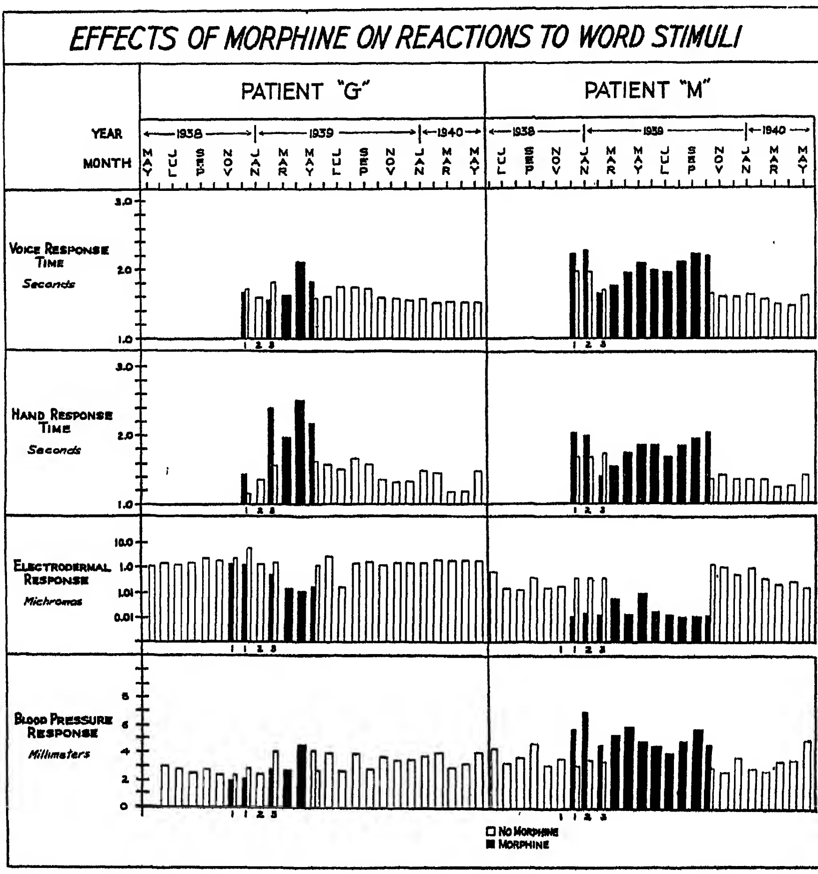

FIGURE 2.

Hand-Response Time

As mentioned in the procedure, the patients were requested to depress the right-hand Luria tremograph key when responding to the word stimuli. The effects of morphine and morphine addiction on this hand-response time are shown in figure 2. It may be noted that in both subjects the time of response was increased during addiction. M showed a reversal in the direction of effect during that period in which three injections per week were being administered, but, with the onset of addiction, he showed a gradual increase in the hand-response time, with a sharp decrease after withdrawal, and this was

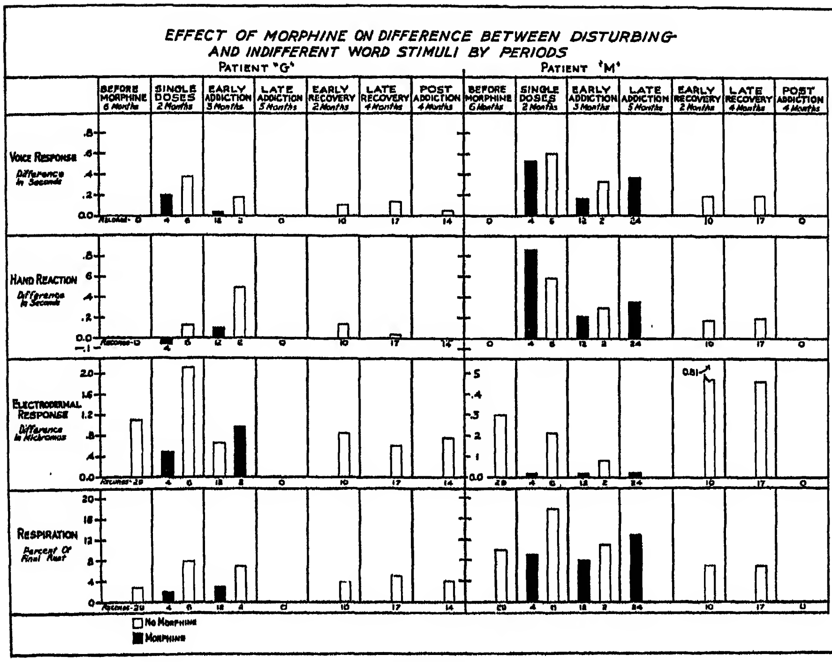

FIGURE 3.

The effects of morphine on differences in hand-response time between indifferent and disturbing word stimuli are shown in figure 3. M showed a greater difference between disturbing and nondisturbing word stimuli on days of morphine injection during the period of single doses. This was the only instance in which morphine differences were greater than nonmorphine differences. As stated above, this measure was not statistically significant for G, but the data are qualitatively similar to the usual finding that morphine reduces the disturbance value of stimuli.

The Electrodermal Response

The average amplitude of the electrodermal response to the word stimuli is shown in figure 2. The changes represented here are the monthly averages for all words combined. The amplitude of response is represented on the ordinate, and was derived by averaging the differences between the conductance level before each word stimulus and the level at the response peak. It may be noted that there was a reduction in the amplitude of the electrodermal response as morphine administration proceeded. This was gradual in G and abrupt in M. It may also be noted that the month of July 1939 showed an electrodermal change for G which is not in agreement with the general trend. During this month the patients were housed in a different section of the hospital, which was the only time they were quartered outside of

their assigned room. Following withdrawal there was marked increase in the amplitude of the electrodermal response in both patients and in the case of M there was a gradual return to the pre-addiction level after approximately 6 months.

The data were analyzed to determine the amplitude of the electrodermal response to the different types of word stimuli. Table 2 shows

TABLE 2.—*Conductance change following word simuli (expressed as micromhos)*

Period		Patient	Disturbing words			Indifferent
			Crime	Drugs	Sex	
Before morphine		G	3.39	3.76	4.30	3.23
		M	0.44	0.55	0.73	0.33
Single doses	Morphine	G	2.50	0.97	2.83	2.07
	No morphine	G	4.88	5.15	5.88	3.68
	Morphine	M	0.01	0.04	0.02	0.01
	No morphine	M	0.18	0.15	0.59	0.08
Early addiction	Morphine	G	3.89	0.46	1.38	1.79
	No morphine	G	2.10	1.95	2.68	2.28
	Morphine	M	0.01	0.04	0.10	0.06
	No morphine	M	0.20	0.53	0.75	0.28
Late addiction		G	---	---	---	---
		M	0.03	0.02	0.05	0.01
Early recovery		G	2.94	2.94	4.19	3.04
		M	1.22	1.03	2.10	0.48
Late recovery		G	4.37	3.11	4.19	2.24
		M	0.70	0.77	1.03	0.48
Post addiction		G	3.01	3.02	4.36	3.81
		M	---	---	---	---

the average amplitude of the electrodermal response (average differences between conductance level before response and at the peak of response) classified into experimental periods. Sex words produced the largest electrodermal response. Following this in decreasing amplitude came the drug, crime, and indifferent words. In the case of G sex words failed to achieve first place on two occasions; once during morphine administration in the early addiction period, and once during the recovery period. Only on one occasion did the sex words fail to give the greatest response in M. This was on the morphine days during the single-injection period, at which time the drug words showed the greatest response, followed by sex, crime, and indifferent words. With the exception of crime words in G both subjects showed a marked increase in response following withdrawal of the drug.

The electrodermal response differences between disturbing and indifferent words were reduced following the administration of morphine. In the case of M, whose amplitude of electrodermal response was considerably less than that of G, the effect of morphine was to reduce the difference to almost zero. Following withdrawal of the drug there was a marked increase in the difference between the two types of stimuli, and the late recovery phase showed a return toward the original level.

Respiration

As previously mentioned, a statistically significant difference between indifferent and disturbing words was found for expiration time and time for five breaths as a percent of final rest. As the results of these two measures were very similar, only those for five breaths are shown in figure 3. It may be noted that wherever morphine records are compared with nonmorphine records in any particular period, the morphine records show smaller differences between the disturbing and nondisturbing words.

Blood Pressure Responses

The average blood pressure response to the word stimuli (all words combined) by monthly averages during the course of the experiment is shown in figure 2. During the period of single injections, morphine days are associated with a decreased response in G and an increased response in M. During the addiction period both patients gave a greater response than at any other time. This change was more marked in M, and is directly opposed to the change in electrodermal response.

This function did not show a statistically significant difference between disturbing and nondisturbing word stimuli.

INTERPRETATION OF RESULTS

The results indicate that the use of morphine is associated with a reduction in efficiency, although the effects are not of sufficient magnitude to constitute a serious disruption of general working efficiency. The voice- and hand-response times to word stimuli were increased, improvement in code learning was delayed, and speed of tapping was decreased during addiction in both patients. The greater variability observed for M with reference to tapping speed would indicate lower efficiency under conditions in which a constant level of performance of this type is required. There were no tests which clearly indicated any beneficial effects of the drug on efficiency. In tests of immediate and delayed recall, the highest scores were achieved under nonmorphine conditions. This was also true with reference to continuous subtraction. G seemed to show continuous improvement in steadiness under morphine, but his addiction level was surpassed under nonmorphine conditions after recovery from withdrawal.

The sudden improvement shown by both patients in tapping speed and continuous subtraction during the first 2 weeks following withdrawal of the drug probably reflects states of excitation during this period. The hyperactivity of M during the withdrawal phase was more pronounced than that observed in G. On continuous subtraction, M obtained his best score soon after withdrawal. The

significant decrease in motor control following withdrawal would be expected under conditions of increased excitation.

The results obtained by studying physiological responses to psychological stimuli indicate that morphine addiction is associated with an increase in hand-and voice-response time, a decrease in the amplitude of the electrodermal response, and an increase in the blood pressure response. Since these functions are highly integrated it is possible that the effects of addiction producing these results is a cortical depression. Andrews *(10)* interpreted some of the findings obtained by means of the electroencephalograph on the basis of cortical depression. This interpretation, however, does not definitely preclude the possibility of a secondary rather than a primary depression of the cortex.

As to the increased blood pressure response to word stimuli during addiction Himmelsbach *(11)* has shown that during addiction the blood pressure response is increased to cold pressor tests. He reported an opposite response to the cold stimulus following morphine in the nonaddicted individual, and in this study G showed a reduced response in the periods when morphine and nonmorphine days were compared.

None of the observed changes in the above experiments indicate the development of tolerance to the morphine effects even though one patient was kept on 300 mg. per day for over 2 months. Many of the functions were affected only slightly during the single-injection and early-addiction phases, with the direction of the effect becoming apparent only after addiction was well-established. This was true for such physiological functions as pulse rate and skin conductance level, as well as most of the psychological functions under discussion.

Probably the most significant finding of the present study is the reduction of the differential response between disturbing and nondisturbing words. The patients differed from each other with respect to certain physiological effects of morphine, such as respiration, temperature, pulse rate, and cortical potentials; and they differed considerably with respect to personality. Despite these differences the effect of morphine in both patients was to reduce the disturbance value of word stimuli. If this type of effect is extended to more realistic life situations, it would indicate that morphine is capable of ameliorating the disruptive effects of personal and social conflicts. Under such circumstances the reason for addiction to morphine and relapse to the use of the drug after various periods of abstinence becomes apparent.

SUMMARY

Psychological and psychophysiological studies were made on two post-addicts before, during, and following the development of tolerance to and dependence on morphine. Both patients were studied every other week over a 2-year period. The following measurements were taken: Johnson code learning, sensitivity to electric current, steadiness, tapping speed, continuous subtraction, Scripture's block oscilla-

tions, immediate and delayed recall of nonsense syllables, voice- and hand-response time and physiological reactions (blood pressure, pulse rate, skin conductance, and respiration) to word stimuli.

It was found that addiction to morphine was associated with a reduction in efficiency. The voice- and hand-response time to word stimuli was slowed; improvement in code learning was delayed; and speed of tapping was decreased during the latter stage of addiction in both patients. With the possible exception of steadiness in the case of G, there were no tests which indicated any beneficial effects of morphine addiction upon efficiency.

The amplitude of the electrodermal response to word stimuli was significantly reduced following the administration of morphine, whereas the blood pressure response to the same stimuli was increased. No satisfactory explanation of the opposite effects of the electrodermal response and blood pressure can be offered on the basis of evidence now available, but it was suggested that a release of lower centers from cortical inhibitory control may be involved.

The polygraphic data were subjected to statistical analysis to determine the extent to which the various functions gave a differential response to disturbing as compared with nondisturbing word stimuli. Statistically significant differences between indifferent and disturbing words were found for both patients with respect to electrodermal response, respiratory changes, and voice-response time. Morphine decreased the response difference between these two types of word stimuli. The suggestion was made that morphine may act to ameliorate the disturbing effects of emotional stress.

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THE RELEASE OF ANTIGEN FROM CERTAIN BACTERIA ON TREATMENT WITH ETHER [1]

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The release of a soluble antigen from typhus fever rickettsiae treated with ether was demonstrated by Topping and Shear (*1*), who shook saline suspensions of yolk sacs containing typhus rickettsiae with diethyl ether, and found that the resulting aqueous phase contained antigen which was not sedimented in the centrifuge along with the rickettsiae. This soluble antigen is complete in the sense that it not only reacts *in vitro* as a complement-fixation test antigen (*1*) and precipitin test antigen (*2*), but it also immunizes guinea pigs against the disease (*1*) and stimulates the formation of antibodies demonstrable in the complement-fixation test (*1*), neutralization test, and precipitin test (*3*).

Ether extraction of typhus-infected yolk sacs yields a much more potent vaccine (*4*), and the commercial production of typhus vaccine in this country utilizes the ether extraction process.

Similar release of antigen as a result of treatment with ether has been shown to occur with Rocky Mountain spotted fever rickettsiae (*Rickettsia rickettsii*) (*5*), *Proteus* OX19 (*3*), and *Pasteurella tularensis* (*6*). Larson (*6*) has also found that ether extraction of tularemia-infected yolk sacs produces a more potent vaccine, as tested in rats.

In this study a number of strains of bacteria have been examined to see if ether causes a release of antigen. Bacterial suspensions have been shaken with ether, and, after removal of the ether and after centrifugation, the supernatants have been examined for antigen by testing them by a precipitin test with rabbit serums prepared with untreated bacterial suspensions.

MATERIALS AND METHODS

Bacteria were cultivated on horse meat infusion agar slants. For the Brucella strains, 0.5 percent dextrose was added. For *Mycobacterium tuberculosis*, 5 percent glycerine agar was used. A suspension of *Pasteurella tularensis*, grown on glucose-cystine-blood agar, was obtained through the courtesy of Dr. Carl L. Larson.[2] Bacterial growths were gently rinsed from the slants and washed three times by centrifugation and resuspension in 0.85-percent saline containing 0.1 percent formalin.

Suspensions for the immunization of rabbits and for antigens in agglutination tests were prepared by diluting stock suspensions to match a 500-p. p. m. silica standard. Except for minor modification, rabbits were immunized by 1-ml. intravenous injections on the first,

[1] From the Division of Infectious Diseases, National Institute of Health.

[2] Division of Infectious Diseases, National Institute of Health.

second, third, eighth, ninth, and tenth days, and they were bled from the heart on the sixteenth day. The *Salmonella enteritidis* serum, however, was prepared by a longer course of less frequent and larger doses.

Agglutination tests were performed by mixing 0.2 ml. of the serum dilution with 0.2 ml. of the bacterial suspension. Tests were incubated at 37° C. for 4 hours and then left overnight at 4° C. before being read. Three of the bacterial suspensions (*M. tuberculosis, Bacillus anthracis,* and an unclassified gram-positive rod) were autoagglutinable, and their titers could not be accurately determined.

The ether treatment of the bacteria was accomplished as follows: Bacterial suspension, five times as concentrated as suspensions matching the 500-p. p. m. silica standard, was placed in a test tube, an approximately equal volume of diethyl ether (U. S. P. XII) was added, and the tube was stoppered and vigorously shaken for 5 seconds. The next morning the supernatant ether was pipetted off and discarded, and air was bubbled through the suspension to remove the dissolved ether. The bacterial bodies were sedimented in an angle centrifuge at 3,500–4,000 r. p. m. for 30 to 40 minutes. This amount of centrifugation was sufficient, except in the case of the tularemia and tuberculosis organisms which required more centrifugation. A control for each strain was treated the same way, except that no ether was added. The supernatants, which were clear in each case, were tested in a precipitin test for the presence of antigen.

Precipitin tests were carried out by mixing 0.2 ml. of dilutions of the supernatants with 0.2 ml. of 1:5 dilutions of the rabbit serums. After 4 hours of incubation in a 37° C. bath, the tests were kept at 4° C. until the next morning when they were read. Preparations were tested against serum prepared with homologous untreated bacterial suspensions, except in the case of the *Salmonella pullorum* antigens which were tested against *Salmonella gallinarum* serum. Serum controls and antigen controls (lowest dilution of antigen tested) were always included, and none showed precipitate.

RESULTS

Table 1 lists the results obtained. The readings, which indicate the amount of precipitate observed, show that the most pronounced reactions were seen with the antigens from *Proteus*, undulant fever, and tularemia organisms.

The precipitates in these tests resemble those seen with typhus antigens and their immune serums. They consist of floccules which sometimes coalesce in the tubes containing the greatest amounts of antigen, so that the sediment is resuspended with difficulty. Not much turbidity is seen in the supernatant even in the tubes near the end point.

TABLE 1.—*Liberation of antigen from bacteria as a result of ether treatment*

Organism	Precipitin tests on supernatants														Agglutination test titer of serum
	Ether-treated									Control					
	1	2	4	8	16	32	64	128	256	1	2	4	8	16	
Proteus OX19	[1] ++++	++++	++++	+++	+	0	0	0	0	0	−	0	−	0	>5.120.
Proteus OX2	++++	++++	+++	++	+	0	0	0	0	0	−	0	−	0	2,560.
Proteus OXK	++++	+++	+++	++	+	0	0	0	0	0	−	0	−	0	2,560.
Proteus HX19	−	++++	+++	++	++	+	0	0	0	−	0	0	0	0	640.
Proteus HX2	−	+++	++	+	0	0	0	0	0	−	0	0	0	0	640.
Proteus morgani	−	++++	+++	++	+	0	0	0	0	−	+	0	0	0	1,280.
Proteus americanus	−	±	0	0	0	0	0	0	0	−	0	0	0	0	320.
Brucella melitensis	++++	+++	++	+	0	0	0	0	0	±	±	0	0	0	2,560.
Brucella abortus	−	++++	++++	+++	++	+	0	0	0	0	0	0	0	0	1,280.
Brucella suis	−	++++	+++	++	+	0	0	0	0	0	0	0	0	0	5,120.
Pasteurella tularensis	++++	++++	++++	++++	++++	++	++	+	0	++	−	0	−	0	1,280.
Shigella paradysenteriae Flexner W	−	+	+	+	+	+	0	0	0	−	0	0	0	0	640.
Eberthella typhosus	−	+++	+++	++	++	+	0	0	0	−	0	0	0	0	640.
Salmonella enteritidis	±	−	±	−	0	−	0	0	0	0	−	0	−	0	1,280.
Salmonella paratyphosus B	−	+++	++	+	+	+	0	0	0	−	+	±	0	0	320.
Salmonelle gallinarum	−	++	+	+	+	+	+	±	0	−	±	0	0	0	640.
Salmonella pullorum	−	+	+	+	+	+	+	0	0	−	+	+	+	0	*S. gallinarum* serum.
Mycobacterium tuberculosis	−	0	0	0	0	0	0	0	0	−	0	0	0	0	Auto-agglutinable.
Bacillus anthracis	++	−	+	−	0	−	0	−	0	+	−	0	−	0	Auto-agglutinable.
Bacillus subtilis	++	−	+	−	0	−	0	−	0	++	−	+	−	0	320.
Unindentified gram-positive rod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Auto-agglutinable.
Staphylococcus aureus	+	−	0	−	0	−	0	−	0	++	−	+	−	0	1,280.
Unindentified gram-positive coccus	+	0	0	0	0	0	0	0	0	0	0	0	0	0	160.

[1] Amounts of precipitate observed from greatest to least (++++ to +). ± indicates a questionable trace of precipitate, 0 no precipitate, and − that the antigen was not tested in that dilution.

On the other hand, the precipitates seen with the enteric organisms (Flexner, typhoid, and the salmonellas) were less voluminous and of a finer texture, and many tubes showed supernatant turbidity above a small amount of sediment.

The five gram-positive organisms tested showed little evidence of release of soluble antigen.

The presence or absence of flagellae did not appear to affect the result markedly. The H and O strains of *Proteus* X19 and X2 behaved similarly. In the organisms tested in the enteric group the nonflagellated organisms (Flexner, *gallinarum*, and *pullorum*) gave reactions not much different from the flagellated organisms.

Microscopic examination of bacterial suspensions exposed to ether gave little information. Some of the gram-negative rods showed a tendency to swell after exposure to ether, but there was little correlation between the estimated amount of swelling and the serological result. However, the tularemia organisms did show pronounced swelling, and in this respect they are similar to typhus fever rickettsiae which also show distinct swelling when treated with ether.

In table 2 are shown the results of centrifugation at a higher speed than that employed earlier. Ether-treated bacterial suspensions from which the ether had been removed were spun in an angle centrifuge at 3,600 r. p. m. for 1 hour. The supernatants were removed, and portions therefrom were centrifuged in an angle head at 14,000 r. p. m. for one-half hour.

The results show no change after high-speed centrifugation for the antigens prepared from *Proteus* OX19 or *Brucella melitensis*. However, the tularemia antigens show some drop in titer. It will be recalled that the tularemia organisms are different from the other organisms here observed in showing greater swelling on exposure to ether and also in requiring more centrifugation.

DISCUSSION

Some of the limitations of the method used for the demonstration of release of bacterial antigens should perhaps be emphasized. Only antigens soluble in saline solution would be detected, since those soluble in ether would be discarded, and those insoluble in ether or saline would be removed by centrifugation. Only antigens reactive in a precipitin test with rabbit serum for the whole organism would be found. Modifications of the test or use of a complement-fixation reaction might make possible detection of other antigens. If the rabbits had been immunized with the antigen preparations themselves, different results might have been had, since ether treatment may have changed the specificity of the antigen. Thus a negative finding may

TABLE 2.—*Results of centrifugation (14,000 r. p. m. for one-half hour) of antigen prepared by ether treatment*

Antigens from—	Precipitin tests														
	Before high-speed centrifugation—antigen dilution								After high-speed centrifugation—antigen dilution						
	1	2	4	8	16	32	64	128	1	2	4	8	16	32	64
Proteus OX19	++++	++++	++++	++++	+++	+	0	0	++++	++++	++++	++++	+++	+	0
Brucella melitensis	++++	++++	+++	++	0	0	0	0	++++	++++	+++	++	0	0	0
Pasteurella tularensis	++++	++++	++++	++++	++++	++	++	+	++++	++++	++++	++	++	+	0

have resulted from a lack of release of bacterial antigen or from a failure of the antigen released to react visibly.

The lethal effect of ether on bacteria was reported by Topley (*7*). It is interesting that the procedure for ether treatment adopted in the present study is almost identical with one used by Topley in 1915.

The relationship of the soluble antigens obtained here to such well-known preparations as those of Boivin and Mesrobeanu (*8*), of Raistrick and Topley (*9*), and of Morgan (*10*) is not as yet established.

SUMMARY

Ether treatment of certain bacteria resulted in the release of soluble antigen as demonstrated in a precipitin test with rabbit serum prepared against untreated organisms. The most abundant precipitates were seen with several strains of *Proteus*, with the three strains of *Brucella*, and with *Pasteurella tularensis*. Less abundant precipitates were seen with several other gram-negative bacilli. Little or no evidence of such soluble antigen was seen with several gram-positive organisms, although only a few strains were tested.

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PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occuring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 22, 1945

Summary

A total of 68,497 cases of influenza was reported for the week, as compared with 148,688 for the preceding week, and 2,717 and 83,973, respectively, for the corresponding weeks of 1944 and 1943. Exclusive of the figures for Kentucky for both weeks, where 60 percent of the cases were reported last week (probably including some estimates), the figures are 61,681 for the current week and 59,325 last week.

Increases were reported in the Middle Atlantic, East North Central, South Atlantic, West South Central, and Pacific areas. The 13 States reporting more than 1,000 cases each for the week, aggregating 53,313 cases, or 89 percent of the total, are as follows (last week's figures in parentheses): *Increases*—Wisconsin 1,293 (388), Virginia 4,796 (4,691), West Virginia 7,219 (3,808), South Carolina 2,696 (2,659), Alabama 1,205 (649), Arkansas 2,021 (644), Oklahoma 1,170 (684), Texas 14,496 (11,259), Idaho 1,144 (279), Arizona 1,608 (1,163); *decreases*—North Dakota 1,134 (1,244), Kansas 7,715 (11,229), Kentucky 6,816 (89,363), Utah 9,434 (17,023).

The total from July to December 22 is 302,704, as compared with 28,879 and 215,986, respectively, for the corresponding periods of 1944 and 1943.

A total of 127 cases of meningococcus meningitis was reported as compared with 92 last week, 172 and 361, respectively, for the corresponding weeks of 1944 and 1943. The total to date is 7,837 as compared with 15,861 and 17,459, respectively, for the corresponding periods of 1944 and 1943, and a 5-year median of 3,587.

The incidence of poliomyelitis continued its downward seasonal trend—90 cases were reported as compared with 115 last week, 89 for the corresponding week last year, and a 5-year median of 48. The total for the year to date is 13,648 as compared with 19,196 and 12,358 for the corresponding periods of 1944 and 1943, and a 5-year median of 9,733.

An aggregate of 9,516 deaths from all causes was recorded for the week in 92 large cities of the United States, as compared with 9,313 last week, 8,576 for the corresponding week last year, and a 3-year (1942–44), average of 9,514 for the same cities. The cumulative total is 423,335, as compared with 423,147 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended December 22, 1945, and comparison with corresponding week of 1944 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44	Week ended—		Median 1940–44
	Dec. 22, 1945	Dec. 23, 1944		Dec. 22, 1945	Dec. 23, 1944		Dec. 22, 1945	Dec. 23, 1944		Dec. 22, 1945	Dec. 23, 1944	
NEW ENGLAND												
Maine	1	0	1	------	------	1	------	3	37	0	0	1
New Hampshire	1	0	0	------	------	------	2	1	4	0	0	0
Vermont	0	0	0	65	------	------	------	4	4	0	1	0
Massachusetts	5	5	4	------	------	------	124	52	294	2	4	4
Rhode Island	0	1	0	7	19	1	1	10	10	0	0	0
Connecticut	2	0	0	17	1	2	5	13	13	1	3	2
MIDDLE ATLANTIC												
New York	8	12	19	[1] 95	[1] 1	[1] 10	317	39	294	12	20	6
New Jersey	4	1	6	103	3	12	14	12	51	6	4	4
Pennsylvania	10	9	9	66	3	3	297	7	678	11	6	6
E. NORTH CENTRAL												
Ohio	38	10	10	191	3	12	8	11	46	3	6	2
Indiana	11	4	7	717	1	20	16	1	33	4	0	0
Illinois	4	1	8	585	2	11	184	21	64	10	9	0
Michigan [2]	16	19	8	6	4	2	219	14	50	5	11	1
Wisconsin	4	1	1	1, 293	18	31	31	13	164	3	5	3
W. NORTH CENTRAL												
Minnesota	7	16	4	------	------	1	4	3	20	2	6	1
Iowa	0	8	2	270	------	1	3	20	64	8	0	0
Missouri	6	6	5	46	------	3	53	4	13	1	1	1
North Dakota	1	16	3	1, 134	10	24	1	3	12	0	1	1
South Dakota	3	0	3	1	------	------	4	2	7	0	2	0
Nebraska	*0	0	1	514	11	5	4	3	8	0	0	0
Kansas	5	20	8	7, 715	2	15	56	7	25	0	2	1
SOUTH ATLANTIC												
Delaware	0	1	0	------	------	------	6	------	1	0	1	0
Maryland [2]	16	10	8	115	7	7	12	4	4	0	8	8
District of Columbia	1	0	0	6	------	3	2	2	3	0	1	1
Virginia	15	3	10	4, 796	181	203	40	5	41	2	10	6
West Virginia	7	0	4	7, 219	17	18	2	14	14	3	1	1
North Carolina	37	6	0	------	7	10	31	18	31	0	3	2
South Carolina	7	12	6	2, 696	377	377	56	2	21	0	0	0
Georgia	8	16	7	298	33	71	3	4	18	0	2	2
Florida	6	7	7	12	------	9	6	------	2	0	5	1
E. SOUTH CENTRAL												
Kentucky	4	3	3	6, 816	3	18	120	1	12	2	4	1
Tennessee	20	12	11	394	16	52	3	7	29	7	4	3
Alabama	7	7	11	1, 205	86	143	------	3	20	4	2	2
Mississippi [2]	14	8	5	------	------	------	------	------	------	1	1	1
W. SOUTH CENTRAL												
Arkansas	18	6	6	2, 021	71	97	10	1	35	2	0	0
Louisiana	9	14	10	44	11	11	3	5	5	1	2	1
Oklahoma	6	13	8	1, 170	88	97	17	8	9	2	4	0
Texas	88	53	36	14, 496	1, 509	1, 320	49	44	44	7	17	2
MOUNTAIN												
Montana	1	1	0	943	1	15	8	1	26	1	1	0
Idaho	1	0	0	1, 144	2	2	30	4	3	1	0	0
Wyoming	0	0	0	------	15	66	15	1	10	1	1	0
Colorado	6	8	8	539	25	36	8	10	79	2	2	0
New Mexico	3	2	0	24	1	3	3	2	4	0	3	0
Arizona	9	0	0	1, 608	154	154	9	3	8	0	1	0
Utah [2]	0	0	0	9, 434	------	43	32	14	14	0	3	1
Nevada	0	0	0	------	------	------	31	------	------	0	0	0
PACIFIC												
Washington	3	17	2	------	------	4	148	40	40	3	3	2
Oregon	2	10	2	426	18	18	16	20	45	0	1	1
California	31	23	15	266	17	102	287	202	87	20	11	1
Total	454	361	281	68, 497	2, 717	2, 717	2, 290	658	4, 608	127	172	92
51 weeks	18, 200	13, 795	15, 236	377, 919	364, 402	293, 567	125, 960	601, 506	594, 435	7, 837	15, 861	3, 587

[1] New York City only.
[2] Period ended earlier than Saturday.

*Correction: Week ended Dec. 15, Nebraska, diphtheria, 2 cases (instead of 24).

Telegraphic morbidity reports from State health officers for the week ended December 22, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended— Dec. 23, 1945	Week ended— Dec. 24, 1944	Median 1940–44	Week ended— Dec. 23, 1945	Week ended— Dec. 24, 1944	Median 1940–44	Week ended— Dec. 23, 1945	Week ended— Dec. 24, 1944	Median 1940–44	Week ended— Dec. 23, 1945	Week ended— Dec. 24, 1944	Median 1940–44
NEW ENGLAND												
Maine	1	0	0	30	52	22	0	0	0	0	0	1
New Hampshire	0	0	0	0	8	8	0	0	0	0	0	0
Vermont	1	0	0	4	4	4	0	0	0	0	0	0
Massachusetts	3	5	1	111	283	238	0	0	0	2	0	0
Rhode Island	0	0	0	10	27	5	0	0	0	2	0	0
Connecticut	0	1	0	22	46	30	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	11	37	4	233	298	284	0	0	0	3	7	6
New Jersey	0	0	0	31	104	92	0	0	0	1	0	0
Pennsylvania	0	2	1	137	192	192	0	0	0	2	3	3
EAST NORTH CENTRAL												
Ohio	0	3	1	205	264	243	1	1	1	0	3	2
Indiana	1	0	0	55	60	68	0	0	0	0	0	1
Illinois	3	0	2	110	135	168	1	0	1	2	0	2
Michigan [2]	2	4	0	185	158	155	0	0	0	1	0	1
Wisconsin	4	2	1	106	122	141	0	0	0	0	1	0
WEST NORTH CENTRAL												
Minnesota	2	2	1	32	69	76	0	0	0	0	0	0
Iowa	5	0	0	42	36	56	1	0	0	0	0	0
Missouri	1	3	0	40	54	54	0	1	1	0	1	3
North Dakota	0	2	0	12	12	12	0	1	0	0	0	0
South Dakota	0	0	0	7	13	19	0	0	2	0	0	0
Nebraska	0	0	0	27	25	25	0	1	0	0	0	0
Kansas	2	0	0	56	100	82	0	1	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	6	4	4	0	0	0	0	0	0
Maryland [2]	0	1	1	28	114	43	0	0	0	0	1	1
District of Columbia	1	0	0	12	37	16	0	0	0	0	0	0
Virginia	0	3	1	75	75	40	0	0	0	1	3	3
West Virginia	0	0	0	38	33	38	0	0	0	0	1	1
North Carolina	0	1	0	48	57	57	0	0	0	0	0	0
South Carolina	0	0	0	7	14	10	0	0	0	1	2	2
Georgia	4	0	0	15	27	23	0	0	0	2	1	1
Florida	3	1	0	5	8	6	0	0	0	5	3	2
EAST SOUTH CENTRAL												
Kentucky	0	1	0	30	32	43	0	0	0	0	2	2
Tennessee	0	0	0	29	58	58	0	0	0	2	0	1
Alabama	1	0	0	10	21	22	0	1	0	0	1	1
Mississippi [2]	4	0	0	30	22	10	0	0	0	0	1	1
WEST SOUTH CENTRAL												
Arkansas	0	1	1	17	8	5	0	0	0	1	0	1
Louisiana	0	1	1	12	10	8	0	0	0	0	0	3
Oklahoma	0	1	0	63	56	27	0	0	0	1	1	1
Texas	7	3	3	131	91	39	0	0	0	5	6	4
MOUNTAIN												
Montana	1	1	0	14	12	30	0	0	0	2	0	0
Idaho	0	0	0	6	51	7	0	2	0	0	0	0
Wyoming	0	2	0	1	18	11	0	0	0	0	0	0
Colorado	0	0	0	36	70	35	0	0	0	2	3	0
New Mexico	1	0	0	22	26	6	0	0	0	1	2	2
Arizona	1	0	0	16	15	5	0	0	0	0	0	1
Utah [2]	1	2	1	22	58	54	0	0	0	0	0	0
Nevada	0	0	0	0	1	1	0	0	0	0	0	0
PACIFIC												
Washington	4	1	1	12	110	44	0	0	0	0	1	1
Oregon	0	3	2	44	37	11	1	0	0	2	1	1
California	26	6	6	213	235	107	0	0	0	3	3	3
Total	90	89	48	2,397	3,362	2,776	4	8	19	41	47	49
51 weeks	13,648	19,196	9,733	170,178	186,557	137,454	343	385	801	4,814	5,349	6,652

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 2; Rhode Island 1; New York 2; New Jersey 1; Michigan 1; Georgia 2; Florida 5; Oklahoma 1; Texas 2; California 2.

Telegraphic morbidity reports from State health officers for the week ended December 22, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Dec. 22, 1945	Whooping cough: Week ended— Dec. 23, 1944	Whooping cough: Median 1940–44	Week ended Dec. 22, 1945: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	44	54	26								
New Hampshire		2	5								
Vermont	19	10	18								2
Massachusetts	124	126	194	1	14						2
Rhode Island	24	24	24								
Connecticut	41	39	39		1						2
MIDDLE ATLANTIC											
New York	169	202	321	2	13			1			1
New Jersey	106	69	130								3
Pennsylvania	90	93	228						1		
EAST NORTH CENTRAL											
Ohio	52	92	133			1			2		
Indiana	13		13								
Illinois	38	47	89	3			1		4		
Michigan [3]	119	56	191	1	23						1
Wisconsin	70	87	128						1		4
WEST NORTH CENTRAL											
Minnesota	23	8	30	2					1		1
Iowa	3		18								
Missouri	9	7	11								1
North Dakota		11	11								
South Dakota	5	3	2								
Nebraska	5	6	3								
Kansas	17	32	39	1			1				2
SOUTH ATLANTIC											
Delaware	1	1	2							1	
Maryland [3]	24	53	53						2		
District of Columbia	6	7	9								
Virginia	46	37	59			15			3		1
West Virginia	8	18	14								
North Carolina	31	81	81			1			1		
South Carolina	86	23	29	5	2					3	
Georgia	6	5	10	1						22	
Florida	3	5	5	1					2	7	1
EAST SOUTH CENTRAL											
Kentucky	6	9	47						6		
Tennessee	8	4	19			1			1		2
Alabama	14	12	12							6	
Mississippi [3]										3	
WEST SOUTH CENTRAL											
Arkansas	1	12	22							2	1
Louisiana		4	4							7	0
Oklahoma	1	8	8								
Texas	147	108	128	9	303	45				21	7
MOUNTAIN											
Montana		9	9								
Idaho	17	12	12								
Wyoming		20	3								
Colorado	16	17	22	1	1						
New Mexico			9	1	1						
Arizona	9	4	4			17					
Utah [3]		8	11								
Nevada	4										
PACIFIC											
Washington	27	23	23								
Oregon	8	3	12								
California	90	90	137	4	7		1			5	6
Total	1,530	1,541	2,455	32	365	80	3	1	24	77	37
Same week, 1944	1,541			59	421	152	5	1	41	111	54
Average, 1942–44	1,772			33	298	71	6	[4] 1	28	[4] 77	
51 weeks: 1945	122,344			1,917	24,434	10,451	615	467	789	5,128	4,770
1944	90,040			1,857	24,295	9,046	625	454	674	5,265	3,771
Average, 1942–44	148,151		[4] 175,128	1,715	18,070	7,604	619	[4] 452	782	[4] 3,662	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1940–44.

Anthrax: Massachusetts 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 15, 1945

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	1	0	------	0	1	0	5	1	1	0	0	7
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	7	0	------	0	5	1	14	1	32	0	0	21
Fall River	0	0	------	0	------	0	1	0	2	0	0	6
Springfield	0	0	------	0	------	0	0	0	6	0	0	------
Worcester	0	0	------	0	4	0	8	1	10	0	0	8
Rhode Island:												
Providence	0	1	------	0	1	0	0	0	4	0	0	18
Connecticut:												
Bridgeport	0	0	------	0	------	0	1	0	1	0	0	------
Hartford	0	0	------	0	1	0	0	0	1	0	0	9
New Haven	0	0	1	1	2	0	3	0	0	0	0	10
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	3	0	1	0	6	0	13	0	0	17
New York	6	1	45	8	61	6	80	3	99	0	0	64
Rochester	0	0	------	0	1	3	1	0	5	0	0	7
Syracuse	0	0	------	2	144	0	2	0	15	0	0	2
New Jersey:												
Camden	0	0	------	1	1	1	1	0	2	0	0	5
Trenton	0	0	4	1	------	0	2	0	2	0	0	------
Pennsylvania:												
Philadelphia	5	0	54	4	64	2	26	0	46	0	0	35
Reading	0	0	------	1	1	0	0	0	0	0	0	15
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	2	3	1	2	1	9	0	23	0	0	5
Cleveland	2	0	60	3	2	3	16	0	10	0	0	17
Columbus	12	0	------	0	------	0	5	0	14	0	0	1
Indiana:												
Fort Wayne	0	0	------	0	------	0	3	0	1	0	0	------
Indianapolis	3	0	------	0	------	1	9	0	5	0	0	6
South Bend	0	0	------	0	------	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	------	0	7	0	0	0	0	------
Illinois:												
Chicago	0	0	13	7	167	4	48	2	45	0	0	42
Springfield	0	0	------	1	1	0	4	1	4	0	0	4
Michigan:												
Detroit	5	0	4	0	55	4	14	1	58	0	0	69
Flint	0	0	------	0	23	0	2	0	9	0	0	3
Grand Rapids	0	0	------	0	1	0	1	0	4	0	0	6
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	1	0	0	------
Milwaukee	0	0	1	1	5	1	4	0	24	0	0	18
Racine	0	0	------	0	------	1	3	0	2	0	0	2
Superior	0	0	------	0	2	0	0	0	0	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	------	0	0	0	3	0	0	1
Minneapolis	3	0	------	0	2	0	5	0	10	0	0	4
St. Paul	1	1	------	2	1	1	1	0	5	0	0	1
Missouri:												
Kansas City	0	0	2	2	20	0	3	0	11	0	0	------
St. Joseph	0	0	------	0	15	0	0	0	1	0	0	------
St. Louis	3	0	22	4	3	2	11	7	14	0	0	1

City reports for week ended December 15, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	------	0	1	0	0	0	1	0	0	------
Nebraska:												
Omaha	0	0	------	2	1	0	5	0	4	0	0	------
Kansas:												
Topeka	0	0	10	0	2	0	0	0	6	0	0	2
Wichita	1	0	1	0	2	0	6	0	5	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	------	0	8	0	1	0	0	1
Maryland:												
Baltimore	11	0	26	2	3	1	7	0	21	0	1	28
Cumberland	0	0	1	0	------	0	2	0	0	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	22	0	2	0	10	0	13	0	0	5
Virginia:												
Lynchburg	0	0	799	0	------	0	1	0	5	0	0	9
Richmond	0	0	2	2	3	1	3	1	7	0	0	3
Roanoke	0	0	------	0	1	0	1	0	1	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	1	0	------	0	1	0	0	0	0	------
North Carolina:												
Raleigh	0	0	------	0	------	0	2	0	1	0	0	------
Wilmington	4	0	------	0	------	0	2	0	4	0	0	2
Winston-Salem	0	0	------	0	------	0	1	0	6	0	0	------
South Carolina:												
Charleston	0	0	101	0	------	0	0	0	1	0	0	------
Georgia:												
Atlanta	0	0	82	0	------	0	10	2	3	0	0	------
Brunswick	0	0	------	0	1	0	1	0	4	0	0	------
Savannah	1	0	11	0	------	0	0	0	2	0	0	------
Florida:												
Tampa	1	0	------	0	------	0	2	0	3	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	1	2	0	7	0	2	0	0	3
Nashville	0	0	------	3	6	0	5	0	2	0	0	------
Alabama:												
Birmingham	1	0	8	2	------	0	0	0	5	0	0	------
Mobile	0	0	------	0	------	0	2	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	------	0	2	0	0	0	0	------
Louisiana:												
New Orleans	4	0	6	2	------	1	5	4	11	0	1	1
Shreveport	0	0	------	0	------	0	4	0	2	0	0	------
Texas:												
Dallas	0	0	2	2	1	0	7	0	4	0	0	------
Galveston	0	0	------	0	------	0	0	0	0	0	0	------
Houston	7	0	------	0	------	1	3	0	8	0	1	------
San Antonio	1	0	15	2	------	0	8	1	0	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	1	0	1	0	0	------
Great Falls	0	0	------	0	------	0	0	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	1	0	1	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	0	0	0	0	0	------
Colorado:												
Pueblo	0	0	------	0	1	0	2	0	3	0	0	3
Utah:												
Salt Lake City	0	0	------	0	------	0	4	0	2	0	0	------

City reports for week ending December 15, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	1	0	------	1	86	1	2	0	9	0	0	12
Spokane	0	0	1	0	6	0	2	0	5	0	0	6
Tacoma	0	0	------	0	39	0	0	0	2	0	0	8
California:												
Los Angeles	1	0	82	2	14	3	5	8	40	0	0	12
Sacramento	1	0	------	0	4	0	0	0	3	0	0	6
San Francisco	2	0	1	0	25	1	5	1	11	0	0	3
Total	84	5	1,383	60	786	40	423	34	693	0	3	510
Corresponding week, 1944	82	------	121	28	203	------	415	------	1,166	0	8	489
Average, 1940-44	73	------	1,698	[1] 96	[2] 1,223	------	569	------	872	2	13	812

[1] 3-year average, 1942-44.
[2] 5-year median, 1940-44.

Dysentery, amebic.—Cases: New York, 3; Chicago, 1; Detroit, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: New York, 80; Charleston, S. C., 2; Memphis, 1; Los Angeles, 1.
Dysentery, unspecified.—Cases: Cincinnati, 1; Columbus, 1; San Antonio, 15.
Tularemia.—Cases: Cincinnati, 1; Chicago, 1; St. Louis, 2; Wichita, 1.
Typhus fever, endemic.—Cases: Atlanta, 2; Savannah, 2; Nashville, 1; Birmingham, 1; Little Rock, 2; New Orleans, 10 (Monthly report from Charity Hospital); Houston, 5; San Antonio, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 33,042,500)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	20.9	2.6	2.6	2.6	37	2.6	86.3	7.8	149	0.0	0.0	206
Middle Atlantic	5.6	0.5	53.9	8.6	139	6.1	60.0	1.5	93	0.0	0.0	74
East North Central	13.4	1.2	49.3	7.9	157	9.1	76.0	2.4	128	0.0	0.0	106
West North Central	15.9	2.0	69.6	19.9	94	6.0	61.7	13.9	119	0.0	0.0	18
South Atlantic	27.8	0.0	1,708.0	6.5	16	3.3	83.4	4.9	118	0.0	1.6	78
East South Central	5.9	0.0	47.2	35.4	47	0.0	82.6	0.0	53	0.0	0.0	18
West South Central	34.4	0.0	66.0	17.2	3	5.7	83.2	14.3	72	0.0	5.7	3
Mountain	0.0	0.0	0.0	0.0	16	0.0	130.2	0.0	114	0.0	0.0	49
Pacific	7.9	0.0	132.8	4.7	275	7.9	22.1	14.2	111	0.0	0.0	74
Total	13.3	0.8	218.8	9.5	124	6.3	66.9	5.4	110	0.0	0.5	81

DEATHS DURING WEEK ENDED DECEMBER 15, 1945

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 15, 1945	Corresponding week 1944
Data for 92 large cities of the United States:		
Total deaths	10,109	9,292
Average for 3 prior years	10,175	------
Total deaths, first 50 weeks of year	445,641	445,311
Deaths under 1 year of age	632	604
Average for 3 prior years	646	------
Deaths under 1 year of age, first 50 weeks of year	29,865	30,450
Data from industrial insurance companies:		
Policies in force	67,248,352	66,904,376
Number of death claims	12,464	12,878
Death claims per 1,000 policies in force, annual rate	9.7	10.1
Death claims per 1,000 policies, first 50 weeks of year, annual rate	10.0	10.1

FOREIGN REPORTS

BRITISH EAST AFRICA

Kenya—Relapsing fever.—A total of 1,552 cases of relapsing fever, with 376 deaths, has been reported in the coastal area of Kenya to November 30, 1945.[1]

CANADA

Provinces—Communicable diseases—Week ended November 24, 1945.—During the week ended November 24, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		13		228	406	51	64	73	178	1,013
Diphtheria		3	3	31	23	9	2			71
German measles		6		3	14		1	11	10	45
Influenza		2			36	1				39
Measles		1	1	116	350		28	29	61	586
Meningitis, meningococcus				2	1			1	2	6
Mumps		2	1	166	85	16	11	87	49	417
Poliomyelitis					[1] 4			3		[1] 7
Scarlet fever		7	13	144	80	10	3	24	19	300
Tuberculosis (all forms)		15	15	93	59	63	2	4	55	306
Typhoid and paratyphoid fever				17	3				1	21
Undulant fever				1	3					4
Venereal diseases:										
Gonorrhea		22	30	104	180	56	48	50	93	583
Syphilis		17	10	153	114	11	3	22	47	377
Other forms				1						1
Whooping cough		3	1	131	43	3		5		186

[1] Includes 1 case, delayed report.

JAMAICA

Notifiable diseases—4 weeks ended October 20, 1945.—During the 4 weeks ended October 20, 1945, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	2	1	Puerperal fever		3
Chickenpox	4	2	Scarlet fever	2	1
Diphtheria	12	9	Tuberculosis, respiratory	55	67
Dysentery, unspecified	12	9	Typhoid fever	16	204
Erysipelas	2	1	Typhus fever	5	1
Leprosy		3			

[1] See PUBLIC HEALTH REPORTS, Dec. 21, 1945, p. 1548.

SAINT HELENA

Poliomyelitis.—Poliomyelitis has been reported on the Island of Saint Helena, with 122 cases and 6 deaths up to December 9, 1945.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Brazil.—During the month of August 1945, 3 cases of plague were reported in Ceara State, and 21 cases with 6 deaths were reported in Pernambuco State.

Smallpox

Mexico—Tuxpan.—During the month of October 1945, 20 cases of smallpox were reported in the port of Tuxpan.

Tunisia.—For the period November 11–20, 1945, 78 cases of smallpox were reported in Tunisia. Of these, 48 were in Nefta, among Algerian nomads. For the period November 21–30, 1945, 7 rural cases were reported.

Turkey.—For the week ended December 8, 1945, 2 cases of smallpox were reported in Turkey, 1 in the port of Seyhan, and 1 in the port of Ordu.

Typhus Fever

Mexico.—For the month of October 1945, 145 cases of typhus fever were reported in Mexico, including 31 cases in Mexico City and 19 in the airport of Monterrey.

Morocco (French).—For the period November 21–30, 1945, 103 cases of typhus fever were reported in French Morocco. Of these, 52 were reported in the region of Casablanca.

Turkey.—During the week ended December 8, 1945, 36 cases of typhus fever were reported in Turkey, including cases in ports as follows: Balikesir 5, Erzurum 2, Kocaeli 1, Istanbul 6, Izmir 6, Seyhan 5, Sinop 1, and Trabzon 1.

Yellow Fever

Colombia.—For the period October 5–10, 1945, 1 fatal case of yellow fever was reported in Los Gorros, Fonseca Municipality, Magdalena Department. For the period August 24–30, 1945, 1 fatal case was reported in Nogales, Bolivar Municipality, Santander de Norte Department.

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Printed With the Approval of the Bureau of the Budget as Required by Rule 42 of the Joint Committee on Printing

AN EPIDEMIC OF A SEVERE PNEUMONITIS IN THE BAYOU REGION OF LOUISIANA

VI. A COMPARATIVE STUDY OF THE VIRUSES OF LYMPHOGRANULOMA VENEREUM, PSITTACOSIS, AND LOUISIANA PNEUMONITIS[1]

By C. L. Larson, *Passed Assistant Surgeon,* and B. J. Olson, *Surgeon, United States Public Health Service*

In previous papers of this series[2] the epidemiological, clinical, pathological, and etiological aspects of an outbreak of severe pneumonitis occurring in the bayou region of southwestern Louisiana were described and the isolation and description of an agent belonging to the psittacosis-lymphogranuloma venereum group of viruses was reported. A virus was isolated from blood, sputum, or lung tissue from three individuals suffering from the disease, and the circumstances surrounding the isolations were such as to indicate causal relation of the virus to the outbreak of human illness. From the data accumulated it was held that the agent had not previously been described and accordingly a new virus belonging to the above group of viruses was designated.

Francis and Magill (*1*) isolated an agent which they termed the virus of acute meningopneumonitis. This virus was extremely infective for mice when administered intracerebrally or intranasally but was capable of producing only occasional deaths in guinea pigs. Eaton, Beck and Pearson (*2*) studied an agent obtained from cases

[1] From the Division of Infectious Diseases, National Institute of Health.

[2] Olson, B. J., and Treuting, W. L.: An epidemic of a severe pneumonitis in the bayou region of Louisiana. I. Epidemiological study. Pub. Health Rep., 40: 1299–1311 (Oct. 6, 1944).

Treuting, W. L., and Olson, B. J.: An epidemic of a severe pneumonitis in the bayou region of Louisiana. II. Clinical features of the disease. Pub. Health Rep., 41: 1331–1350 (Oct. 13, 1944).

Binford, Chapman H., and Hauser, George H.: An epidemic of a severe pneumonitis in the bayou region of Louisiana. III. Pathological observations. Report of autopsy on two cases with a brief comparative note on psittacosis and Q fever. Pub. Health Rep., 42: 1363–1373 (Oct. 20, 1944).

Olson, B. J., and Larson, C. L.: An epidemic of a severe pneumonitis in the bayou region of Louisiana. IV. A preliminary note on etiology. Pub. Health Rep., 42: 1373–1374 (Oct. 20, 1944).

Olson, B. J., and Larson, C. L.: An epidemic of a severe pneumonitis in the bayou region of Louisiana. V. Etiology. Pub. Health Rep., 60: 1448–1503 (Dec. 14, 1945).

of pneumonitis in California and differentiated it from the viruses of meningopneumonitis and psittacosis. This virus had a low intraperitoneal virulence for mice as compared to a high intranasal or intracerebral virulence for these animals but was more infective intraperitoneally for guinea pigs than was meningopneumonitis virus. In a subsequent paper, Beck, Eaton, and O'Donnell (*3*) state that the viruses belonging to the group which cause atypical pneumonitis in man may be divided into three groups based upon pathogenicity and latency tests and upon active cross immunity tests. The groups would include (*a*) psittacosis, (*b*) ornithosis, and (*c*) human pneumonitis (Strain S-F) of unknown origin. Meyer and Eddie (*4*), and Meyer, Eddie, and Yanamura (*5*) described the virus of ornithosis, and showed that it was of very low virulence for mice when given intraperitoneally. The available evidence indicates that except for the source in nature the viruses of ornithosis and meningopneumonitis are identical. Rivers and Berry (*6, 7*) have shown that guinea pigs develop fever and occasionally succumb as a result of intraperitoneal inoculation with psittacosis virus and that mice are extremely susceptible to infection.

On the basis of reports in the literature it appeared that the agents of pneumonitis in man which resemble the virus described by us were those of psittacosis and meningopneumonitis. Lymphogranuloma venereum, mouse pneumonitis, and Eaton's S-F viruses can be eliminated on the basis of their failure to produce illness or death in mice or guinea pigs inoculated intraperitoneally. It was considered that by the criteria of infectivity of the viruses for mice when inoculated by various routes and of virulence of these viruses for guinea pigs when inoculated intraperitoneally, the differentiation between psittacosis, meningopneumonitis, and Louisiana pneumonitis virus could be made. This paper records the results of such tests, which serve to separate this virus from the others under consideration.

EXPERIMENTAL

It was demonstrated in a previous report in this series (V. Etiology) that mice were susceptible to the virus of Louisiana pneumonitis by every route tested and it was considered that this fact was a differential character between this agent and those responsible for psittacosis and meningopneumonitis. This hypothesis was tested and found to be essentially correct.

The original experiment designed to test the differential susceptibility of mice to these agents when administered by various routes employed the intracerebral and subcutaneous routes of inoculation. Since it was known that the viruses used produced death by the former method of inoculation, only 5 mice were given 0.03 cc. of each of the respective viruses intracerebrally. Groups of 50 mice each were

tested with each virus subcutaneously, using doses of 0.3 cc. The viruses employed consisted of a 10-percent suspension of infected mouse spleen in 0.85-percent salt solution. The Louisiana pneumonitis strain was one isolated from case 17 and was in the fourth mouse passage. The psittacosis virus was isolated by the senior author from a budgerigar, and the meningopneumonitis virus was obtained from Dr. Thomas Francis, Jr. (School of Public Health, University of Michigan). The results are shown in table 1. All the agents were capable of killing all mice injected intracerebrally with the amounts of inocula used. However, there was a marked difference in the degree of susceptibility of mice to subcutaneous administration of the different infectious agents. Only 2 percent of the mice given meningopneumonitis virus subcutaneously succumbed; 16 percent of those receiving psittacosis virus died; and 98 percent of the mice given Louisiana pneumonitis virus succumbed.

TABLE 1.—*Effect of subcutaneous and intracerebral introduction of 10-percent spleen suspension of meningopneumonitis, psittacosis, or Louisiana pneumonitis virus into mice*

Type of virus	Route of inoculation	Size of inoculum (cc.)	Number of mice inoculated	Number of mice dying	Percentage of mice dying
Meningopneumonitis	Intracerebral	0.03	5	5	100
Do	Subcutaneous	.3	50	1	2
Psittacosis	Intracerebral	.03	5	5	100
Do	Subcutaneous	.3	50	8	16
Louisiana pneumonitis	Intracerebral	.03	5	5	100
Do	Subcutaneous	.3	50	49	98

These results were upheld by further study. Another group of mice was tested for susceptibility to these agents, using intracerebral, intraperitioneal, and subcutaneous routes of inocculation. Ten-percent suspensions of spleen in salt solution were used; doses of 0.03 cc. were given intracerebrally, 0.3 cc. intraperitoneally, and 0.3 cc. subcutaneously. The results obtained are shown in table 2. It is

TABLE 2.—*Results obtained following inoculation of mice with 10-percent spleen suspensions of mouse passage strains of meningopneumonitis, psittacosis, and Louisiana pneumonitis virus employing intracerebral, intraperitoneal, and subcutaneous routes of injection*

Type of virus	Route of inoculation	Size of inoculum (cc.)	Number of mice inoculated	Number of mice dying	Percentage of mice dying
Meningopneumonitis	Intracerebral	0.03	10	10	100
Do	Intraperitoneal	.3	10	2	20
Do	Subcutaneous	.3	10	0	0
Psittacosis	Intracerebral	.03	10	10	100
Do	Intraperitoneal	.3	10	10	100
Do	Subcutaneous	.3	10	3	30
Louisiana pneumonitis	Intracerebral	.03	7	7	100
Do	Intraperitoneal	.3	10	9	90
Do	Subcutaneous	.3	10	8	80

apparent from tables 1 and 2 that inoculation of these viruses into mice by the subcutaneous route serves to differentiate psittacosis and meningopneumonitis virus on the one hand, and Louisiana pneumonitis virus on the other.

Another experiment was made to determine the effect on mice of inoculation of the various viruses by intraperitoneal, intramuscular, and subcutaneous routes. The viruses were titered by intracerebral introduction of 0.03 cc. of serial tenfold dilutions of mouse spleen containing meningopneumonitis and psittacosis virus and serial hundredfold dilutions of Louisiana pneumonitis virus. The titers obtained (table 3) indicate that the source of meningopneumonitis virus used contained fewer fatal infective units per cubic centimeter than

TABLE 3.—*Comparison of the results obtained following inoculation of mice intracerebrally, subcutaneously, intraperitoneally, and intramuscularly with mouse-passage strains of tissue suspensions containing meningopneumonitis, psittacosis, or Louisiana pneumonitis virus*

Type of virus	Route of inoculation	Size of inoculum (cc.)	Dilution of suspension	Number of mice inoculated	Number of mice dying	Percentage of mice dying
Meningopneumonitis	Intracerebral	0.03	[1] 10^{-3}	8	8	100
Do	do	.03	10^{-4}	8	4	50
Do	do	.03	10^{-5}	8	1	12
Do	do	.03	10^{-6}	8	0	0
Do	Intraperitoneal	.3	10^{-1}	16	0	0
Do	Intramuscular	.3	10^{-1}	16	0	0
Do	Subcutaneous	.3	10^{-1}	16	0	0
Psittacosis	Intracerebral	.03	[2] 10^{-4}	8	8	100
Do	do	.03	10^{-5}	8	5	37
Do	do	.03	10^{-6}	8	0	0
Do	Intraperitoneal	.3	10^{-1}	16	12	75
Do	Intramuscular	.3	10^{-1}	16	0	0
Do	Subcutaneous	.3	10^{-1}	16	1	6
Louisiana pneumonitis	Intracerebral	.03	[3] 10^{-5}	8	8	100
Do	do	.03	10^{-7}	8	0	0
Do	Intraperitoneal	.3	10^{-1}	16	16	100
Do	Intramuscular	.3	10^{-1}	16	15	94
Do	Subcutaneous	.3	10^{-1}	16	13	81

[1] All mice given 10^{-1} and 10^{-2} dilutions intracerebrally died.
[2] All mice given 10^{-1}, 10^{-2}, 10^{-3} dilutions intracerebrally died.
[3] All mice given 10^{-1}, 10^{-2}, 10^{-3}, and 10^{-4} dilutions intracerebrally died.

either of the other viruses. The dilutions of viruses were introduced intracerebrally in doses of 0.03 cc. and those containing LD_{50} doses were 1.5×10^{-4}, 1.6×10^{-5}, and 1×10^{-6} for meningopneumonitis, psittacosis, and Louisiana pneumonitis virus, respectively. The results shown in table 3 should be interpreted with the above dosage of virus in mind. The dose of meningopneumonitis virus used failed to kill any of the mice injected by subcutaneous, intraperitoneal, or intramuscular route, and the concentration of psittacosis virus used was capable of producing death among 75 percent of mice inoculated intraperitoneally but was nonfatal when injected by other routes. The concentration of Louisiana pneumonitis virus employed produced fatal infections in 100 percent of those mice injected intraperitoneally, 94 percent of those injected intramuscularly, and 81 percent

of the mice inoculated subcutaneously. The essential difference between the viruses under study is that the Louisiana virus is capable of infecting and producing death in the majority of mice regardless of the route of inoculation, while the other viruses show a considerable degree of variation in the percent of fatal infection induced, depending upon the route of injection.

TITRATION OF VIRUS

The demonstration of the fact that the Louisiana virus was capable of producing fatal infection in mice when inoculated by the subcutaneous, intramuscular, or intraperitoneal route as well as by the intracerebral route suggested that it might be possible to distinguish this agent from other related viruses by comparative titrations of virus administered to mice by various routes.

Pooled lots of liver and spleen from mice moribund or recently dead following inoculation with one of the above viruses were employed. The tissues were removed from the mice, ground in a mortar, and suspended in sufficient salt solution to make a 10-percent suspension. Further tenfold dilutions of the respective suspensions were made to 10^{-8} in 0.85-percent salt solution. Doses of 0.03 cc. and 0.3 cc. of each dilution of each virus were given to groups of five mice each by intracerebral or intraperitoneal inoculation. The animals were observed for 14 days following inoculation. The results of such an experiment are shown in table 4.

It is apparent that meningopneumonitis virus has but little ability to produce fatal illness in mice when administered intraperitoneally,

TABLE 4.—*Relative intracerebral and intraperitoneal infectivity for mice of meningopneumonitis, psittacosis, and Louisiana pneumonitis virus when serial ten-fold dilutions of 10 percent tissue virus is administered to groups of 5 mice for each dilution and doses of 0.03 cc. and 0.3 cc. are given by the respective routes*

Dilution of tissue suspension	Route of inoculation	Strain of virus inoculated into mice			
		Meningopneumonitis—number of mice dying [1]	Psittacosis—number of mice dying [1]	Louisiana pneumonitis (case 17)—number of mice dying [1]	Louisiana pneumonitis (case 16)—number of mice dying [1]
10^{-1}	Intracerebral	5/5	5/5	5/5	5/5
10^{-2}	do	5/5	5/5	5/5	5/5
10^{-3}	do	5/5	5/5	5/5	5/5
10^{-4}	do	4/5	5/5	5/5	5/5
10^{-5}	do	0/5	4/5	1/5	4/5
10^{-6}	do	1/5	2/5	2/5	1/5
10^{-7}	do	0/5	0/5	1/5	2/5
10^{-8}	do	0/5	0/5	0/5	0/5
10^{-1}	Intraperitoneal	1/5	4/5	5/5	5/5
10^{-2}	do	2/5	4/5	5/5	5/5
10^{-3}	do	0/5	5/5	4/5	5/5
10^{-4}	do	1/5	2/5	4/5	5/5
10^{-5}	do	0/5	1/5	3/5	4/5
10^{-6}	do	0/5	0/5	0/5	1/5
10^{-7}	do	1/5	0/5	0/5	1/5
10^{-8}	do	0/5	0/5	0/5	0/5

[1] Numerator=number of mice dying; denominator=number of mice inoculated.

while it produces considerable mortality when given intracerebrally. The strain of psittacosis virus used was about a hundred times more infectious by the intracerebral than by the intraperitoneal route. The results obtained with the pneumonitis virus from case 16 show that there is essentially no difference in the titer of virus as obtained by inoculation of mice by either route, and this is likewise shown by the results obtained by using a strain of pneumonitis virus isolated from case 17.

The data gathered in this way show that there is a definite difference in the tropism of the three viruses. This difference is manifested when serial dilutions of virus are administered to mice by intraperitoneal and intracranial routes and is of value in identifying the agents.

REACTION OF GUINEA PIGS TO INFECTIONS WITH PSITTACOSIS, MENINGOPNEUMONITIS, AND LOUISIANA PNEUMONITIS VIRUS

Guinea pigs are susceptible to infections produced by intraperitoneal inoculation of material containing the Louisiana virus but are not usually affected to a similar degree by contact with the viruses of psittacosis or meningopneumonitis. This difference between the reaction of these viruses in guinea pigs was tested in the following experiment.

Suspensions containing 10-percent spleen tissue from mice dying of psittacosis and meningopneumonitis infections were prepared. Similar preparations were made from the spleens of mice that died following injection of a second-passage strain of virus obtained from the sputum of case 17. Guinea pigs weighing about 300 gm. which had shown no febrile reaction for 2 weeks prior to inception of the experiment were used. Groups of eight mice each were inoculated intracerebrally with 0.03 cc. of the respective viruses for control. Groups of four guinea pigs each were injected by the intraperitoneal route, with the three viruses. In these groups of four, two animals were given 0.25 cc. and two were given 0.5 cc. of the suspension. The results are shown in table 5. Observations were made for 12 days after inoculation.

The febrile reactions are shown in figure 1. The psittacosis and meningopneumonitis viruses in the quantities administered were capable of producing febrile reactions of varying degree and duration in guinea pigs but failed to produce other symptoms or death. The virus isolated from cases of pneumonitis in Louisiana, however, produced a febrile, fatal disease in all guinea pigs tested. Death occurred in 7 to 9 days and fever within 3 or 4 days after inoculation. Weakness, anorexia, and emaciation constituted the main signs and symptoms of illness in these animals. The pathological features include splenomegaly and a fibrinous exudate in the peritoneal cavity.

TABLE 5.—*Susceptibility of guinea pigs to intraperitoneal inoculation of 0.5 cc. or 0.25-cc. amounts of 10-percent tissue suspensions containing meningopneumonitis, psittacosis, or Louisiana pneumonitis virus*

Strain of virus inoculated	Guinea pig No.	Dose of inoculum (cc.)	Duration of fever in days	Clinical illness	Death
Meningopneumonitis	1	0.25	8	0	0
Do	2	.25	5	0	0
Do	3	.5	5	0	0
Do	4	.5	9	0	0
Psittacosis	5	.25	5	0	0
Do	6	.25	5	0	0
Do	7	.5	7	0	0
Do	8	.5	1	0	0
Louisiana pneumonitis	9	.25	4	+	+
Do	10	.25	5	+	+
Do	11	.5	5	+	+
Do	12	.5	4	+	+

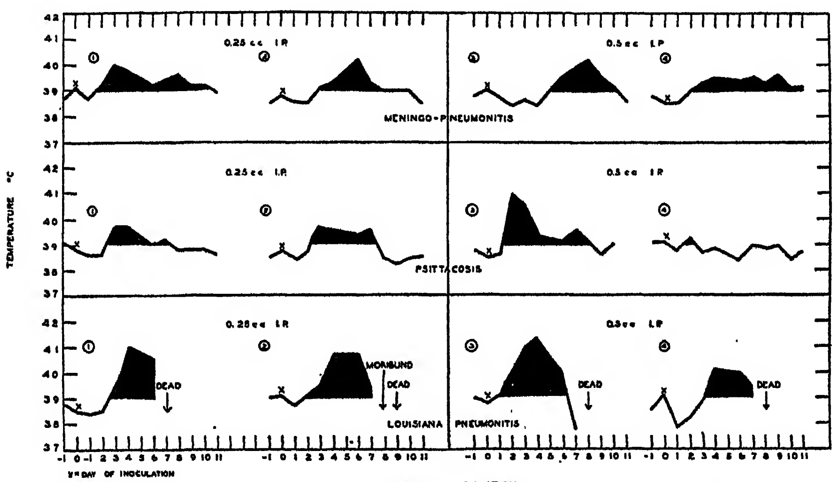

FIGURE 1.—Results obtained in guinea pigs following intraperitoneal inoculation of 0.25 cc. of meningopneumonitis, psittacosis, or Louisiana pneumonitis virus

IMMUNITY TEST

In order to determine further whether the three agents under consideration could be differentiated by other methods than those previously discussed, mice and guinea pigs were immunized with killed antigens of these viruses and these immunized animals were tested by intraperitoneal inoculation of graded doses of Louisiana pneumonitis virus.

Antigens were prepared by adding 0.2 percent formalin to 10-percent suspensions of infected yolk-sac tissues in salt solution and storing the mixtures at ice-box temperatures for a week before use. The mixtures were frequently agitated during this interval. Membranes for use in the preparation of vaccines were selected on the

basis of the large number of demonstrable elementary bodies, and the finished vaccines were shown to contain large numbers of these bodies when samples were smeared and stained with Machiavello's stain. The virus content of the suspensions used to prepare the vaccines was not determined.

Groups of mice and guinea pigs were given 0.25-cc. doses of the respective vaccines on two occasions at 8-day intervals. Vaccine was administered intraperitoneally. Two weeks after administration of the last dose of vaccine the animals were tested for their resistance against graded doses of Louisiana pneumonitis virus. Groups of immunized animals were given intraperitoneally 0.3-cc. amounts of mouse spleen virus diluted 10^{-2}, 10^{-3}, 10^{-4}, and 10^{-6} in salt solution. Normal mice and guinea pigs were used as controls and were given 0.3 cc. of the same virus intraperitoneally, using tenfold serial dilutions from 10^{-2} to 10^{-7}. The results are shown in table 6. The virus used was capable of producing death in 50 percent of normal

TABLE 6.—*Results of immunity test in mice and guinea pigs immunized with two intraperitoneal injections of formaldehyde-killed yolk-sac virus vaccine of meningopneumonitis, psittacosis, or Louisiana pneumonitis, and tested for the presence of immunity against various dilutions of Louisiana pneumonitis virus administered intraperitoneally*

Dilution of Louisiana pneumonitis administered intraperitoneally	Dose of virus (cc.)	Mice tested for resistance											
		Not immunized			Immunized with meningopneumonitis vaccine			Immunized with psittacosis vaccine			Immunized with Louisiana pneumonitis vaccine		
		Number tested	Number dying	Percent dying	Number tested	Number dying	Percent dying	Number tested	Number dying	Percent dying	Number tested	Number dying	Percent dying
10^{-2}	0.3	10	10	100	21	20	95	14	13	93	24	13	54
10^{-3}	.3	10	8	80	21	20	95	14	13	93	24	16	67
10^{-4}	.3	10	10	100	24	24	100	14	13	93	24	15	63
10^{-5}	.3	10	8	80	------	------	------	------	------	------	------	------	------
10^{-6}	.3	10	7	70	24	21	88	14	12	86	24	4	17
10^{-7}	.3	10	5	50	------	------	------	------	------	------	------	------	------
		Guinea pigs tested for resistance											
10^{-2}	.3	5	5	100	5	5	100	5	5	100	5	0	0
10^{-3}	.3	5	4	80	5	3	60	5	5	100	5	1	20
10^{-4}	.3	5	4	80	5	3	60	5	2	40	5	0	0
10^{-5}	.3	5	3	60	------	------	------	------	------	------	------	------	------
10^{-6}	.3	5	2	40	5	3	60	5	2	40	5	0	0
10^{-7}	.3	5	0	0	------	------	------	------	------	------	------	------	------

mice receiving 0.3 cc. of a 10^{-7} dilution of virus intraperitoneally and in 40 percent of normal guinea pigs receiving 0.3 cc. of a 10^{-6} dilution by the same route. The vaccine prepared from Louisiana pneumonitis virus resulted in almost complete protection of guinea pigs and partial protection of mice from infection with this virus. Animals vaccinated with killed suspensions of the other agents failed to resist

infection with Louisiana pneumonitis virus. The vaccine prepared from Louisiana pneumonitis virus was administered to two humans without producing untoward results.

Numerous attempts were made to demonstrate protective antibodies in the serum of patients and of guinea pigs recovered from infections with this virus and of rabbits given killed or living virus. Guinea pigs and white mice were used as test animals, and intracerebral, intraperitoneal, and combined routes of inoculation were employed. Serum and virus were given separately by the same or different routes and at different intervals or were combined and incubated at varying temperatures from 4° C. to 37° C. for periods of 1 to 24 hours before injection. No evidence was obtained to indicate that serums possessed any protective antibodies.

COMPLEMENT-FIXATION TESTS

Complement-fixation tests were performed on a variety of serums, employing a variety of antigens. These included antigens prepared from ornithosis, psittacosis, lymphogranuloma venereum, and Louisiana pneumonitis viruses grown in the yolk sac of chicken embryos. The yolk sacs were suspended in salt solution containing 0.1 percent formalin and were used as 10-percent suspensions. Serums were obtained from rabbits immunized with living virus contained in mouse tissue, from humans recovered from ornithosis, psittacosis, lymphogranuloma venereum, and S-F pneumonitis, and from a pigeon from which ornithosis virus had been isolated. The tests were run according to the method employed by Bengtson (*8*). The results shown in table 7 indicate that the agent under study belongs to the psittacosis-lymphogranuloma venereum group of viruses but that complement fixation failed to differentiate the viruses tested from others.

DISCUSSION

The psittacosis-lymphogranuloma venereum group of viruses contains a number of agents producing disease in various hosts. Until the recent work of Hilleman (*9*) no reliable method was available for the serological differentiation of the agents contained within the group.[3] The studies here presented show that the agent responsible for pneumonitis among humans in the bayou region of Louisiana may be differentiated from the viruses of psittacosis and meningopneumonitis. This is based primarily upon the ability of the former agent to produce fatal infection in mice inoculated subcutaneously or intramuscularly and consistently to produce fatal infections in guinea pigs inoculated intraperitoneally.

[3] The study by Hilleman appeared after work with this virus was completed.

TABLE 7.—*Complement-fixation reactions obtained with certain serums tested against antigens prepared from psittacosis, ornithosis, lymphogranuloma venereum and Louisiana pneumonitis virus*

Type of serum	Source of virus		Titer obtained with different antigens			
	Species	Identity	Psittacosis	Ornithosis	Louisiana pneumonitis	Lymphogranuloma venereum
Louisiana pneumonitis	Rabbit	B	1:256	1:128	1:128	1:16
Do	do	B 1	1:128	1:64	1:64	
Do	do	B 2	1:32	1:16	1:32	
Do	do	B 3	1:64	1:32	1:32	
Do	do	B 4	1:128	1:256	1:256	
Meningopneumonitis	do	MP 1	1:4	1:4	1:8	1:4
Do	do	MP 2	1:16	1:8	1:16	
Psittacosis	do	PS	1:8	1:8	1:64	1:8
Do	do	PS 1	1:8	1:4	1:8	
Do	do	PS 2	1:16	1:8	1:16	
Ornithosis	Pigeon	P	1:256	1:128	1:256	1:4
S-F [1]	Human	S-F	1:10	1:10	1:10	
Louisiana pneumonitis	Human	Pool	1:32	1:16	1:64	1:4
Do	do	Ortego	1:4	1:4	1:8	
Lymphogranuloma venereum.	do	L. G. V.	1:128	1:64	1:128	1:64
Do	do	Mob	1:32	1:8	1:32	1:16
Psittacosis	do	Cal	1:128	1:128	1:256	
Do	do	John	1:64	1:64	1:32	
Do	do	Mil	1:32	1:16	1:32	

[1] S-F virus isolated by Eaton, Beck, and Pearson (*2*).

SUMMARY

Louisiana pneumonitis virus may be differentiated from psittacosis and meningopneumonitis virus by its ability to produce fatal infections in guinea pigs inoculated intraperitoneally and in mice inoculated subcutaneously or intramuscularly.

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TULAREMIA

ATTEMPTED TRANSMISSION BY EACH OF TWO SPECIES OF FLEAS: *XENOPSYLLA CHEOPIS* (ROTHS.) AND *DIAMANUS MONTANUS* (BAKER) [1]

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The role of fleas in the transmission of plague and the mechanism by which these insects carry the infection from one animal to another are well established. Neither of these factors has been put on a firm basis in the epidemiology of tularemia. The disease has been transmitted under experimental conditions by the bites of infected flies (*Stomoxys calcitrans* (*1*) and *Chrysops discalis* (*2*)), ticks (*Dermacentor andersoni* (*3*), and *Dermacentor variabilis* (*4*)), bed bugs (*Cimex lectularius* (*2*)), and mosquitoes (*Aëdes aegypti* (*5*)). McCoy (*6*) placed infected animals in a container with fleas and later placed healthy animals in the same container. Some of these became infected, but the experimental methods adopted do not furnish definite information of the transmission of the infection by flea bites.

For purposes of these investigations, two species of fleas were chosen, *Xenopsylla cheopis* (Roths.) (rat flea) and *Diamanus montanus* (Baker) (California ground squirrel flea). Tularemia occurs only occasionally among rats, but the rat flea is an efficient vector of plague and attacks other animals readily. The squirrel flea is also a good vector of plague and is common to ground squirrels, among which tularemia is frequently found.

The fleas were bred in the laboratory and were held without food for 72 hours. They were then placed in clean containers with white mice, which had been infected with a strain of tularemia isolated from a ground squirrel. Previous to exposure to the fleas, the mice had developed a high grade of bacteremia as determined by the observation of many organisms per microscopic field of their blood. The fleas were allowed to remain with the mice for from 2 hours to approximately 15 hours, until the death of the latter, and were then removed. Three hundred and four *X. cheopis* and 201 *D. montanus* were thus given an opportunity to become infected. For practical purposes, the *X. cheopis* fleas were divided into 3 lots numbering respectively 119, 105, and 80, and each lot was fed on a different infected mouse. In like manner, the 201 *D. montanus* were divided into each of 2 lots of 113 and 88, and similarly fed. In other words, a lot was the number of fleas of the given species which was afforded the opportunity to feed on a single infected mouse.

[1] From Plague Suppressive Measures, States Relations Division, Bureau of State Services.

The subsequent disposition of each of the lots was as follows:

X. cheopis:

Lot 1:

(a) 20 were killed and each was promptly inoculated into an animal.
(b) 26 were killed and stored in 2-percent saline for future inoculation.
(c) 24 were killed and stored dry for future inoculation.
(d) 24 were preserved alive for subsequent tests of transmission by biting.
(e) 25 were placed on a normal guinea pig in a clean container.

Lot 2: In the same categories, there were (a) 20; (b) 24; (c) 20; (d) 41; (e) none.

Lot 3: There were (a) 60; and (d) 20; (b, c, and e) none.

D. montanus:

Lot 1: (a) 20; (b) 24; (c) 24; (d) 20; (e) 25.

Lot 2: (a) 30; (b) 20; (c) 20; (d) 18; (e) none.

Exposure to the fumes of calcium cyanide was used to kill fleas in the various tests.

The fleas which were promptly inoculated, from all lots (category (a)), were each triturated in saline within 4 hours after they were removed from the container in which they had had an opportunity to feed on an infected mouse, and the emulsion of each flea was injected subcutaneously into a normal mouse. It was found that varying percentages of the fleas in each group taken from the individual lots produced the disease in mice when tested by this procedure. The results are shown by lots in table 1, and it will be noted that there was a variation of from 68 to 95 percent among the respective lots which apparently became infected. These percentages were used as the indices of the probability, or expectancy, of infection in the remainder of the fleas in each lot.

TABLE 1.—*Percentage of fleas found infected, when afforded opportunity to feed on an infected mouse* [1]

Species of flea	Lot No.	Number of fleas	Maximum time [2] of exposure to infected mice	Percent positive
X. cheopis	1	20	Overnight	90
Do	2	20	Do	70
Do	3	60	Do	68
D. montanus	1	20	2 hours	95
Do	2	30	Overnight	80

[1] Fleas were killed immediately after removal from these mice and inoculated into a normal mouse.
[2] On every occasion the infected mouse died during the night.

The fleas of lots 1 and 2 of both *X. cheopis* and *D. montanus* which were killed and stored in saline, or were stored dry (categories (b) and (c)), were held for periods of from 3 to 13 days at room temperature (approximate mean of 73° F.), and were then triturated in saline in groups of 2 to 4 each, and the emulsion injected subcutaneously into individual normal white mice. It was found that none of the

inoculations of the several groups caused the development of infection when injected after 5 days of storage under dry conditions, and among the groups of *X. cheopis* the results were the same when stored in saline. However, four of the groups of *D. montanus* produced the infection after 6 to 7 days of storage (table 2). Since it was found that the micro-organism was viable in fleas immediately after they

TABLE 2.—*Period of survival* P. tularensis *in fleas exposed to infected mouse* [1]

Method stored	Species of flea	Number of groups of fleas inoculated	Number of fleas inoculated	Number of groups found infectious after storage for different periods		
				3–5 days	6–7 days	8–13 days
Dry	*X. cheopis*	6	24	4		
	Do	3	12		0	
	Do	2	8			0
	D. montanus	4	16	3		
	Do	4	16		0	
	Do	3	12			0
2 percent Saline	*X. cheopis*	4	16	4		
	Do	4	16		0	
	Do	5	18			0
	D. montanus	4	16	3		
	Do	4	16		4	
	Do	3	12			0

[1] Fleas were killed, stored dry or in saline, and inoculated in groups of 2 to 5 into healthy mice.

were removed from an infected animal and killed, it appears that it may remain viable in the dead fleas in storage for not more than 6 to 7 days, and usually for less than 6 days, under the conditions of these tests. This finding may be of practical significance in that it may very well explain the failure to obtain evidence of the infection by the injection of fleas which have been collected in the field and shipped to a remote point for examination. It has been noted that the frequency with which infection was produced in the laboratory by the inoculation of fleas which had been 5 to 6 days in transit from the field has not seemed to represent the probable incidence of tularemia among the rodents in the locality under survey, when other circumstances were taken into consideration.

Eighteen or more fleas were held from each of the five lots (category (d)), to determine whether they would transmit the infection by biting. Upon removal from an infected mouse, each flea was placed in a separate clean test tube and transferred to a clean tube every 4 days throughout its life. The entire number was kept at room temperature, which varied from a minimum of 66° F. and a maximum of 80° F., with a mean of 73° F. The maximum temperature of 80° F. did not persist for more than a few hours during any day of the period through which the fleas were held. Each flea was given an opportunity, individually, to bite the clipped abdomen of normal white mice at intervals of from 1 to 4 days until the flea died or was killed.

Several fleas were fed on each mouse, and when a flea survived sufficiently long it was fed on more than one mouse. The maximum number of mice on which any one flea fed was 12. The droppings of every flea were injected into a mouse to determine whether they would produce infection; and, upon its death, the flea was triturated in saline and the suspension inoculated subcutaneously into a mouse. The production of the disease by either or both of these procedures was the criterion on which a flea was classified as infected. The total number of *X. cheopis* thus found was 41, whereas the expectancy of infection was 62.0 percent, and there were 19 infected *D. montanus* and an expectancy of 32.7 percent. The number of times the infected fleas of each lot fed on a normal mouse during an interval of 1 to 4 days, and thereafter weekly, are indicated in table 3. During the first 4 days, one or more infected *X. cheopis* bit and fed on normal mice 33 times, and infected *D. montanus* fed 25 times. After the fourth day, there were 141 feedings by *X. cheopis* and 113 by *D. montanus*.

TABLE 3.—*Expected and proved infection in fleas, with number of feedings on healthy mice, and period of survival*

Species and lot number of fleas	Total number of fleas	Number of infected fleas expected	Number of infected fleas proved	Period of survival									
				1-4 days		5-12 days		13-20 days		21-28 days		29-36 days	
				Number of fleas infected	Number of feedings or chances to infect	Number of fleas infected	Number of feedings or chances to infect	Number of fleas infected	Number of feedings or chances to infect	Number of fleas infected	Number of feedings or chances to infect	Number of fleas infected	Number of feedings or chances to infect
X. cheopis: Lot 1	24	21.6	9	9	8	9	15	9	20	1	1	------	------
X. cheopis: Lot 2	41	28.7	23	23	17	21	27	20	26	14	14	3	6
X. cheopis: Lot 3	20	13.6	9	8	8	7	12	6	15	6	5	------	------
Total	85	62.0	41	40	33	37	54	35	61	21	20	3	6
D. montanus: Lot 1	20	19.0	15	15	21	14	36	11	30	8	17	6	8
D. montanus: Lot 2	18	14.4	4	4	4	4	10	3	6	2	4	2	2
Total	38	32.7	19	19	25	18	46	14	36	10	21	8	10
Grand total	123	94.7	60	59	58	55	100	49	97	31	41	11	16

From among 35 infected *X. cheopis* which survived from 13 to 20 days, 14 were killed. These were killed because they had failed to excrete infectious droppings, and it was believed from analogous experience with plague that they had therefore not become infected. Six of the 14 produced the infection upon the inoculation of the suspension of the individual fleas, though, as noted, they had not previously produced infectious droppings. In table 3, the data are recorded concerning the expectancy of infection among the fleas by lots, the number proved to be infected, and the number of feedings or chances to infect normal animals.

In considering the opportunities for the fleas to infect by biting, it was believed that those which might transmit the disease previous to the fifth day after feeding on an infected animal would have acted as mechanical vectors only; and the bites which occurred after the fourth day were regarded as those which would be more likely to transmit infection if an intrinsic development of the micro-organism occurred, comparable to that which occurs among fleas infected with plague. There were 58 bites and feedings by 59 infected fleas of the five lots during the first 4 days, and 254 additional bites by the fleas which survived more than 4 days. None of these bites was followed by the development of the disease in 46 mice which had received from 1 to as many as 14 bites.

Experience with the longevity of *Pasteurella pestis* within fleas previous to the transmission of the infection by the flea bite suggests that a period longer than the 29 to 36 days through which the fleas of this experiment were held might result in the transmission of tularemia by the bites of infectious fleas. However, fleas which carry *P. pestis* over long periods continue to excrete droppings which are infectious throughout the period previous to their transmitting the infection by biting. While in these experiments with 60 fleas which had been found to be infected, there were only two which excreted droppings after the twelfth day which produced the disease when injected subcutaneously into mice. One of these two continued to excrete infectious droppings until its death on the thirty-second day, and the injection of a mouse with the saline suspension of this flea produced the disease.

Twenty-five fleas of each species of lot 1 (category (e)), were placed in clean glass cages on normal guinea pigs, and were thus afforded opportunity to feed for a period of 32 days, but did not produce infection in the pig. Under the expectancy which had been determined 22+ of the *X. cheopis* and 23+ of the *D. montanus* should have contained the micro-organism. Neither the droppings nor the fleas of this experiment were inoculated because of the lack of control over them during the exposure of the fleas to the animal.

The methods of obtaining definite evidence of the presence of *Pasteurella tularensis* in living fleas appear to be either the cultivation of suspensions of their excreta on artificial media, or the injection of these suspensions into a white mouse, which is very susceptible to the infection. Neither of these methods is regarded as entirely satisfactory, but the difficulty of culturing the micro-organisms of tularemia in the presence of contaminating bacteria influenced the choice of the method of injecting the mouse. It will be noted in table 3 that the greatest discrepancy between the number of fleas which might be expected to be infected and the number determined

to be infected by this method, or by the inoculation of the suspension of the triturated flea, occurred in lot 2 of *D. montanus*. No satisfactory explanation for this marked discrepancy has been developed.

The discovery of the infection in six of the fleas of lot 2 of *X. cheopis* which were triturated and injected into an animal 16 days after they had fed on an infected mouse, and without having excreted infectious droppings during the intervening period, was contrary to the observations in all other instances. Here again, no satisfactory explanation on this apparent discrepancy has been developed.

DISCUSSION

The role of fleas (*X. cheopis* and *D. montanus*) in the transmission of tularemia has not been determined by these experiments. However, there is evidence that they ingest infected blood and harbor the microorganism in a viable and virulent state for periods of 1 to 16 days, and in exceptional instances for 32 days, when maintained during the period by feeding on normal animals.

Tularemia is reported to be readily contracted through the contact of specific infectious material with the mucous membranes, or with the abraded skin. Therefore, it would seem that ample opportunity for infection of animals was afforded by the hundreds of deposits, on the fur, of infectious flea droppings which could be introduced into the skin by the biting or scratching of the animal. Or, in event these droppings became pulverized, they could come in contact with the conjunctiva, or could be inhaled. Experiments conducted during these tests have shown that the droppings are infectious for at least 21 days after drying.

The exposure for 32 days of guinea pigs to fleas, among which it seems probable that at least 22 harbored the micro-organism for a period, and deposited many droppings on the fur of the animal, might be expected to afford opportunities for their infection through bites or contact with the droppings. However, the animals did not become infected.

After consideration of these several observations, it is concluded that the two species of fleas tested do not play an important role in the transmission of tularemia, and it is the opinion of the senior author that this conclusion may be extended to many species.

Tularemia occurs frequently among rabbits of North America, which are hosts to a genus of fleas (*Cediopsylla*) which have serrated mouth parts and which feed by attaching themselves to the host in a manner similar to that practiced by ticks. A small number of these fleas were tested and became infected, but they did not survive in sufficient numbers for transmission tests. Additional experiments to determine the role of these rabbit fleas in the transmission of tularemia are in progress.

SUMMARY

From 68 to 90 percent of *X. cheopis,* and 80 to 95 percent of *D. montanus* fleas became infected when given an opportunity to feed on tularemia-infected white mice.

The disease was produced by the inoculation of infected fleas or of their feces for varying periods (up to 32 days in *X. cheopis*).

Fleas killed immediately after infection and stored at room temperature as long as 5 days in dry condition, or for 7 days in saline, produced tularemia when triturated and injected into healthy mice.

Fifty-nine infected fleas (*X. cheopis* and *D. montanus*) biting 46 normal white mice 312 times failed to produce tularemia in the mice.

Twenty-five fleas each of *X. cheopis* and *D. montanus* that were exposed to tularemia-infected mice and then placed in clean cages with healthy guinea pigs did not produce the disease in animals over a period of 32 days.

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INCIDENCE OF HOSPITALIZATION, NOVEMBER 1945

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among about 10,000,000 members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover about 60 hospital service plans scattered throughout the country, mostly in large cities.

Item	November	
	1944	1945
1. Number of plans supplying data	76	78
2. Number of persons eligible for hospital care	15,560,515	18,841,442
3. Number of persons admitted for hospital care	129,388	162,954
4. Incidence per 100 persons, annual rate, during current month (daily rate × 365)	101.4	105.3
5. Incidence per 1,000 persons, annual rate for the 12 months ended November 30, 1945	104.2	106.4
6. Number of plans reporting on hospital days	24	29
7. Days of hospital care per case discharged during month [1]	7.77	8.70

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED DECEMBER 22, 1945

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 22, 1945	Corresponding week, 1944
Data for 92 large cities of the United States:		
Total deaths	9,516	8,576
Average for 3 prior years	9,514	
Total deaths, first 51 weeks of year	423,335	423,147
Deaths under 1 year of age	577	568
Average for 3 prior years	574	
Deaths under 1 year of age, first 51 weeks of year	29,272	29,755
Data from industrial insurance companies:		
Policies in force	67,225,173	66,901,551
Number of death claims	13,511	12,991
Death claims per 1,000 policies in force, annual rate	10.5	10.2
Death claims per 1,000 policies, first 51 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 29, 1945

Summary

For the second week the reported incidence of influenza declined. A total of 52,947 cases was reported, as compared with 68,551 last week, 3,466 and 126,488 for the corresponding weeks, respectively, of 1944 and 1943, and a 5-year (1940–44) median of 3,466. Increases were reported in only 2 of the 9 geographic areas—the East and West South Central. Increases occurred in 7 of the 13 States reporting more than 1,000 cases each, as follows (last week's figures in parentheses): *Increases*—Virginia 5,907 (4,796), South Carolina 3,243 (2,696), Kentucky 8,071 (6,816), Alabama 1,218 (1,205), Louisiana 7,255 (44), Oklahoma 1,176 (1,170), Idaho 1,151 (1,144); *decreases*—Wisconsin 1,034 (1,293), Kansas 2,586 (7,715), West Virginia 2,302 (7,219), Arkansas 1,924 (2,021), Texas 10,660 (14,496), Arizona 1,385 (1,608).

A total of 364,672 cases has been reported since July 1, as compared with 32,345 and 343,574, respectively, in the corresponding periods of 1944 and 1943, and a 5-year median of 35,379. For the 52 weeks of the current year the total is 431,146, as compared with 367,868 and 421,155 for 1944 and 1943, respectively. For the last quarter of the current year, 354,962 cases were reported, as compared with 335,330 in the same period of 1943, which was the largest number reported for the corresponding period in any of the past 10 years. The peak of incidence in the epidemic of 1943–44 was reached in the first week of January, with a report of 126,610 cases.

Of the total of 162 cases of meningococcus meningitis reported, as compared with 127 last week and 187 for the 5-year median, 74 were reported as follows: Illinois and California 14 each, New York and Texas 13 each, and New Jersey and Pennsylvania 10 each.

The report of 25 cases of poliomyelitis in Wisconsin included delayed reports.

Deaths recorded for the week in 93 large cities of the United States totaled 11,384, as compared with 10,458 last week, 9,934 for the corresponding week last year, and a 3-year (1942–44) average of 11,549. The total for the 52 weeks of the year is 471,714, as compared with 468,773 last year.

Telegraphic morbidity reports from State health officers for the week ended December 29, 1945, and comparison with corresponding week of 1944, and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended— Dec. 29, 1945	Week ended— Dec. 30, 1944	Median 1940–44	Week ended— Dec. 29, 1945	Week ended— Dec. 30, 1944	Median 1940–44	Week ended— Dec. 29, 1945	Week ended— Dec. 30, 1944	Median 1940–44	Week ended— Dec. 29, 1945	Week ended— Dec. 30, 1944	Median 1940–44
NEW ENGLAND												
Maine	2	0	0	3	------	------	------	4	35	0	0	0
New Hampshire	0	0	0	2	------	------	1	------	1	0	0	0
Vermont	1	0	0	44	7	------	------	------	13	0	0	0
Massachusetts	3	8	4	------	------	------	157	61	223	3	6	6
Rhode Island	1	1	0	8	21	------	------	------	3	0	0	0
Connecticut	4	0	0	13	------	1	11	20	20	2	2	2
MIDDLE ATLANTIC												
New York	7	14	14	[1] 71	[1] 3	[1] 15	499	57	542	13	29	19
New Jersey	3	4	4	163	5	17	26	17	150	10	12	8
Pennsylvania	8	14	14	22	1	1	354	28	533	10	13	10
EAST NORTH CENTRAL												
Ohio	44	5	7	123	3	14	14	9	47	8	7	5
Indiana	9	16	10	469	11	37	10	6	32	3	6	4
Illinois	7	8	19	56	11	24	303	18	84	14	16	8
Michigan [2]	19	11	10	5	2	6	174	11	99	5	10	4
Wisconsin	4	5	1	1,034	11	44	44	17	217	0	6	2
WEST NORTH CENTRAL												
Minnesota	4	4	2	2	1	------	3	71	71	1	3	0
Iowa	2	4	2	388	------	1	8	11	40	3	2	1
Missouri	5	3	3	52	7	7	55	3	11	4	6	6
North Dakota	0	7	2	679	3	17	------	------	16	0	0	0
South Dakota	2	1	2	2	------	------	3	------	1	1	0	0
Nebraska	0	1	1	144	5	------	5	8	8	0	0	0
Kansas	7	4	5	2,586	1	10	40	15	62	1	1	1
SOUTH ATLANTIC												
Delaware	0	1	0	------	------	------	2	5	4	0	1	0
Maryland [2]	11	10	3	105	1	5	11	4	9	0	2	2
District of Columbia	0	0	1	45	1	4	1	------	4	1	3	1
Virginia	7	10	14	5,907	279	432	29	16	103	2	6	0
West Virginia	15	1	2	2,302	15	17	6	4	16	6	0	0
North Carolina	20	14	14	------	7	7	17	15	136	4	3	3
South Carolina	9	2	7	3,243	417	440	36	4	45	0	0	1
Georgia	8	3	5	497	20	65	14	------	25	6	1	1
Florida	3	3	5	11	2	16	4	------	2	5	1	0
EAST SOUTH CENTRAL												
Kentucky	8	4	5	8,071	7	25	167	------	32	3	4	3
Tennessee	6	7	6	443	47	61	23	70	66	7	10	0
Alabama	12	14	13	1,218	71	194	3	4	5	6	6	3
Mississippi [2]	6	7	7	------	------	------	------	------	------	4	3	2
WEST SOUTH CENTRAL												
Arkansas	8	4	7	1,924	126	126	7	8	34	1	3	3
Louisiana	13	7	7	7,225	6	10	5	0	3	2	6	2
Oklahoma	2	8	8	1,176	71	120	7	3	4	1	0	0
Texas	33	56	50	10,660	2,121	2,121	50	71	66	13	9	3
MOUNTAIN												
Montana	0	7	2	472	------	15	2	3	41	0	1	1
Idaho	2	0	0	1,151	1	2	105	1	3	0	0	0
Wyoming	1	0	0	3	18	55	15	3	3	1	0	0
Colorado	5	2	5	278	25	69	25	6	59	1	0	0
New Mexico	2	1	1	3	1	1	6	------	------	1	0	0
Arizona	3	0	2	1,385	109	157	------	4	26	0	2	0
Utah [2]	0	0	0	369	------	55	27	10	10	2	0	0
Nevada	0	0	0	1	------	------	7	3	------	0	0	0
PACIFIC												
Washington	7	21	4	------	------	3	272	18	18	3	2	2
Oregon	7	7	3	307	14	18	29	37	55	1	2	2
California	21	32	24	285	15	60	146	237	168	14	14	12
Total	341	331	323	52,947	3,466	3,466	2,723	891	5,786	162	198	187
52 weeks	18,541	14,126	15,559	*431,146	367,868	367,868	128,683	602,397	602,085	7,999	16,059	3,774

[1] New York City only. [2] Period ended earlier than Saturday.

* Delayed reports: Washington, influenza, week ended Dec. 15, 226 cases; Dec. 22, 54 cases.

Telegraphic morbidity reports from State health officers for the week ended December 29, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— Dec. 29, 1945	Poliomyelitis: Week ended— Dec. 30, 1944	Poliomyelitis: Median 1940–44	Scarlet fever: Week ended— Dec. 29, 1945	Scarlet fever: Week ended— Dec. 30, 1944	Scarlet fever: Median 1940–44	Smallpox: Week ended— Dec. 29, 1945	Smallpox: Week ended— Dec. 30, 1944	Smallpox: Median 1940–44	Typhoid and paratyphoid fever[3]: Week ended— Dec. 29, 1945	Typhoid and paratyphoid fever[3]: Week ended— Dec. 30, 1944	Typhoid and paratyphoid fever[3]: Median 1940–44
NEW ENGLAND												
Maine	0	0	0	28	58	14	0	0	0	1	1	1
New Hampshire	0	1	0	2	20	9	0	0	0	0	0	0
Vermont	0	0	0	3	6	8	0	0	0	0	0	0
Massachusetts	1	0	0	114	251	246	0	0	0	2	2	2
Rhode Island	0	0	0	5	17	9	0	0	0	0	0	0
Connecticut	1	0	0	28	61	29	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	3	30	2	233	406	285	0	0	0	2	2	2
New Jersey	1	1	1	56	109	95	0	0	0	2	0	1
Pennsylvania	2	0	0	197	251	180	0	0	0	4	3	3
EAST NORTH CENTRAL												
Ohio	1	4	2	221	242	225	0	0	0	13	2	2
Indiana	1	0	0	54	144	122	1	0	1	1	1	0
Illinois	5	5	3	117	255	182	0	0	1	0	0	1
Michigan [2]	5	0	1	147	214	160	0	0	0	0	2	2
Wisconsin	[a] 25	3	3	99	114	114	0	2	0	0	1	0
WEST NORTH CENTRAL												
Minnesota	3	0	0	38	62	62	0	0	0	0	1	0
Iowa	0	2	2	26	64	62	0	0	0	0	0	0
Missouri	3	3	0	41	69	57	1	0	0	1	0	0
North Dakota	0	2	0	12	11	11	0	1	0	0	0	0
South Dakota	0	0	0	9	10	22	0	0	0	0	1	0
Nebraska	0	0	0	18	34	24	1	0	0	0	0	0
Kansas	1	1	1	47	111	65	0	0	0	1	1	0
SOUTH ATLANTIC												
Delaware	0	0	0	4	3	3	0	0	0	0	0	0
Maryland [2]	0	1	0	23	117	53	0	0	0	0	3	3
District of Columbia	0	0	0	9	60	26	0	0	0	0	0	1
Virginia	0	0	0	68	80	50	0	0	0	2	2	4
West Virginia	0	1	1	24	28	46	0	0	0	0	0	0
North Carolina	0	0	0	20	48	49	0	0	0	1	0	0
South Carolina	2	1	1	14	5	10	0	0	0	1	1	0
Georgia	4	0	0	14	17	22	0	0	0	0	0	2
Florida	2	0	0	10	1	9	0	0	0	2	0	1
EAST SOUTH CENTRAL												
Kentucky	0	1	1	40	51	51	0	0	0	0	0	2
Tennessee	0	1	0	20	83	70	0	0	0	6	0	1
Alabama	3	1	0	8	11	20	0	0	0	5	2	2
Mississippi [2]	0	2	1	6	41	11	1	0	0	0	1	0
WEST SOUTH CENTRAL												
Arkansas	1	0	0	7	22	8	1	1	1	2	0	0
Louisiana	0	0	0	25	17	8	0	0	0	3	0	4
Oklahoma	0	0	0	16	21	21	1	1	1	2	2	1
Texas	2	0	2	74	94	57	0	0	1	7	8	6
MOUNTAIN												
Montana	3	0	0	15	13	13	0	0	0	0	0	0
Idaho	0	1	0	6	40	17	0	0	0	0	0	0
Wyoming	0	0	0	4	10	4	0	0	0	0	0	0
Colorado	1	0	1	47	57	26	0	0	0	0	0	0
New Mexico	0	1	0	11	23	10	0	0	0	3	0	1
Arizona	0	0	0	8	14	9	0	0	0	0	0	0
Utah [2]	1	1	1	15	41	41	0	0	0	0	0	0
Nevada	0	0	0	0	2	0	0	0	0	0	0	0
PACIFIC												
Washington	7	4	1	40	65	42	0	0	0	0	2	1
Oregon	2	0	1	30	26	9	0	0	0	0	1	1
California	6	9	2	149	260	116	0	0	0	0	4	3
Total	[a] 86	76	42	2,211	3,759	2,858	6	5	17	61	43	80
45 weeks	13,734	19,272	9,769	172,389	190,316	140,475	349	390	863	4,875	5,392	6,703

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Maine 1; Massachusetts 2; New York 1; Ohio 10.

[a] Includes delayed reports.

Telegraphic morbidity reports from State health officers for the week ended December 29, 1945, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Dec. 29, 1945	Whooping cough: Week ended— Dec. 30, 1944	Whooping cough: Median 1940–44	Week ended Dec. 29, 1945: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	9	21	21								
New Hampshire	7	7	7								1
Vermont	52	34	17								
Massachusetts	93	94	125		4						2
Rhode Island	17		8								
Connecticut	17	71	38		4						1
MIDDLE ATLANTIC											
New York	213	206	328	4	5		2		1		2
New Jersey	97	65	85	8							
Pennsylvania	86	153	153								2
EAST NORTH CENTRAL											
Ohio	55	87	104						3		
Indiana	18	15	15			2					
Illinois	51	51	120	1					1		3
Michigan [3]	64	55	163								1
Wisconsin	36	67	110								3
WEST NORTH CENTRAL											
Minnesota		15	30	5							
Iowa		12	16								
Missouri	3	20	13			2					1
North Dakota		4	4								
South Dakota	6	12	2								
Nebraska	1		2								
Kansas	7	28	28								2
SOUTH ATLANTIC											
Delaware	1	9	2								
Maryland [3]	7	61	55						2		
District of Columbia	8	2	11								
Virginia	34	33	36			34			3	1	
West Virginia	5	10	13								
North Carolina	20	35	76	1					1	1	
South Carolina	44	23	33	2	13					3	
Georgia		2	4							11	
Florida	2	1	6							1	
EAST SOUTH CENTRAL											
Kentucky	11	8	24						10		
Tennessee	24	31	24						6	1	1
Alabama	5	4	21				1			9	1
Mississippi [3]									1		
WEST SOUTH CENTRAL											
Arkansas	1	23	17	3	3				1	1	4
Louisiana			1	1						4	
Oklahoma	3	3	3	1	2						
Texas	83	136	136	8	230	36				11	1
MOUNTAIN											
Montana	1	2	3								
Idaho	42	1	1								1
Wyoming	1	7	3								
Colorado	12	6	14	5	1						
New Mexico			12	1	4						
Arizona		7	14				1				
Utah [3]	6	3	16								2
Nevada	5										
PACIFIC											
Washington	25	16	27								4
Oregon	8	9	7								1
California	30	121	128	1			1			1	1
Total	1,210	1,570	2,530	41	266	74	5	0	29	44	34
Same week, 1944	1,570			42	737	94	10	1	45	72	58
Average, 1942–44	1,830			26	349	127	13	[4] 0	33	[4] 58	
52 weeks: 1945 [3]	123,554			1,958	24,700	10,525	620	467	818	5,167	4,804
1944	95,610			1,899	25,032	9,140	635	455	719	5,337	3,829
Average, 1942–44	149,980		[4] 176,415	1,741	18,419	7,731	632	[4] 452	816	[4] 3,729	

[3] Period ended earlier than Saturday.
[4] 5-year median 1940–44.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 22, 1945

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	0	0	1	0	0	------
New Hampshire:												
Concord	0	0	------	0	------	0	2	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	2	0	------	0	17	1	11	1	26	0	1	30
Fall River	0	0	------	0	------	0	2	0	2	0	0	1
Springfield	0	0	------	0	------	0	0	0	5	0	0	2
Worcester	0	0	------	0	4	0	10	0	6	0	0	10
Rhode Island:												
Providence	0	0	------	0	1	0	2	0	7	0	2	1
Connecticut:												
Bridgeport	0	0	------	0	------	0	2	0	2	0	0	1
Hartford	0	0	1	0	------	0	1	0	4	0	0	4
New Haven	0	0	3	0	------	0	2	0	1	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	3	0	2	1	7	0	4	0	0	26
New York	7	0	95	4	60	10	96	5	100	0	1	57
Rochester	0	0	------	0	2	0	5	0	2	0	0	11
Syracuse	0	0	------	1	169	3	2	0	11	0	0	8
New Jersey:												
Camden	1	0	1	1	------	0	0	0	0	0	0	3
Newark	0	0	27	1	1	0	14	0	7	0	1	25
Trenton	0	0	2	1	------	0	2	0	2	0	0	------
Pennsylvania:												
Philadelphia	3	0	65	2	53	6	21	0	27	0	0	33
Pittsburgh	2	0	9	8	------	1	11	0	6	0	0	2
Reading	0	0	1	0	3	0	4	0	4	0	0	10
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	5	0	------	1	6	0	13	0	16	0	0	------
Cleveland	1	0	22	1	1	1	20	0	8	0	0	15
Columbus	7	0	8	8	3	0	4	0	10	0	0	3
Indiana:												
Fort Wayne	0	0	------	0	1	0	4	0	0	0	0	------
Indianapolis	5	0	------	0	7	1	9	0	13	0	0	7
South Bend	0	0	------	0	1	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	------	0	1	0	0	0	0	------
Illinois:												
Chicago	1	0	10	7	182	10	49	1	45	0	1	18
Springfield	2	0	------	0	------	0	6	0	3	0	0	------
Michigan:												
Detroit	8	1	4	2	48	1	15	2	37	0	0	35
Flint	0	0	------	3	39	0	6	0	5	0	0	------
Grand Rapids	0	0	------	0	4	0	0	0	5	0	0	------
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	0	0	0	1
Milwaukee	0	0	1	0	3	3	3	0	11	0	0	21
Racine	0	0	1	1	2	0	0	0	1	0	0	2
Superior	0	0	------	0	1	0	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	------	0	1	0	2	0	0	1
Minneapolis	4	0	------	1	------	0	5	0	10	0	0	1
St. Paul	2	0	------	3	------	2	1	0	4	0	0	7
Missouri:												
Kansas City	0	0	5	3	33	0	19	0	12	0	0	5
St. Joseph	0	0	------	0	8	0	0	0	1	0	0	------
St. Louis	0	0	33	3	5	1	3	1	9	0	0	2

City reports for week ended December 22, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	1	0	------	0	------	0	0	0	1	0	0	------
Nebraska:												
Omaha	0	0	------	2	2	0	7	0	4	0	0	------
Kansas:												
Topeka	0	0	8	0	15	0	3	0	3	0	0	------
Wichita	0	0	------	0	2	1	5	0	7	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	1	5	0	8	0	0	0	0	------
Maryland:												
Baltimore	15	0	61	2	2	0	20	0	11	0	0	21
Cumberland	0	0	------	1	------	0	1	0	1	0	0	------
Frederick	0	0	------	0	------	0	0	0	1	0	0	------
District of Columbia:												
Washington	1	0	6	1	2	0	13	1	12	0	0	6
Virginia:												
Lynchburg	1	0	850	0	------	0	1	0	7	0	0	------
Richmond	0	0	1	2	1	0	4	0	5	0	0	------
Roanoke	0	0	------	0	------	1	0	0	4	0	0	------
West Virginia:												
Charleston	0	0	2	0	------	0	0	0	0	0	0	------
Wheeling	0	0	2	0	------	1	0	0	1	0	0	------
North Carolina:												
Raleigh	0	0	------	0	------	0	2	0	0	0	0	2
Wilmington	0	0	------	0	------	0	2	0	0	0	0	2
Winston-Salem	0	0	------	0	------	0	4	0	2	0	0	4
South Carolina:												
Charleston	1	0	41	0	------	0	0	0	2	0	0	------
Georgia:												
Atlanta	0	0	107	3	------	1	3	0	0	0	0	------
Brunswick	0	0	------	0	------	0	0	0	0	0	0	------
Savannah	1	0	11	0	------	0	1	0	5	0	0	------
Florida:												
Tampa	0	0	------	0	------	0	2	0	1	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	2	3	7	1	8	0	5	0	0	1
Nashville	2	0	------	1	6	0	2	0	3	0	0	4
Alabama:												
Birmingham	1	0	90	2	------	0	4	0	3	0	1	------
Mobile	0	0	33	1	------	0	0	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	2	0	17	0	------	0	1	0	3	0	0	------
Louisiana:												
New Orleans	5	0	5	4	5	1	7	2	6	0	0	------
Shreveport	0	0	------	0	------	0	2	0	3	0	0	------
Texas:												
Dallas	3	0	3	1	------	2	6	0	10	0	0	1
Galveston	1	0	------	0	------	0	0	0	0	0	0	------
Houston	8	0	------	0	------	2	10	0	8	0	0	1
San Antonio	2	0	6	0	------	1	6	0	0	0	0	2
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	2	0	0	0	0	------
Great Falls	0	0	------	0	------	0	0	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	115	0	------	0	0	1	3	0	1	------
Idaho:												
Boise	0	0	------	0	------	0	1	0	0	0	0	------
Colorado:												
Pueblo	0	0	------	0	1	0	2	0	2	0	0	------
Utah:												
Salt Lake City	0	0	------	1	9	0	1	0	2	0	0	------

City reports for week ended December 22, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	0	------	0	6	0	0	0	0	------
Spokane	0	0	1	1	13	0	0	0	1	0	0	2
Tacoma	0	0	------	0	44	0	0	1	3	0	0	13
California:												
Los Angeles	1	0	74	5	13	1	4	7	45	0	0	15
Sacramento	1	0	------	0	3	0	1	0	0	0	0	4
San Francisco	2	0	1	0	19	2	5	0	10	0	0	1
Total	100	1	1,727	82	805	55	497	22	585	0	8	426
Corresponding week, 1944	85	------	66	30	152	------	403	------	1,064	0	12	403
Average, 1940–44	70	------	2,476	[1] 123	[2] 1,487	------	[1] 668	------	940	2	13	812

[1] 3-year average, 1942–44.
[2] 5-year median, 1940–44.

Anthrax.—Cases: Boston 1.
Dysentery, amebic.—Cases: Boston 1; New York 1; Chicago 2; Detroit 1; Brunswick 1; Los Angeles 1; San Francisco 1.
Dysentery, bacillary.—Cases: Bridgeport 1; New York 7; Rochester 1; Detroit 2; Charleston, S. C., 2; Los Angeles 2.
Dysentery, unspecified.—Cases: San Antonio 13.
Rocky Mountain spotted fever.—Cases: New York 1.
Tularemia.—Cases: Chicago 1; Wichita 1; Memphis 1.
Typhus fever, epidemic.—Cases: Atlanta 2; Savannah 1; Tampa 2; Little Rock 2; New Orleans 1; Houston 1; Los Angeles 6.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 34,057,700)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	5.2	0.0	10.5	0.0	58	2.6	83.6	2.6	141	0.0	7.8	133
Middle Atlantic	6.0	0.0	94.0	8.3	134	9.7	75.0	2.3	75	0.0	0.9	81
East North Central	17.6	0.6	28.0	14.0	181	9.7	70.1	1.8	95	0.0	0.6	63
West North Central	15.9	0.0	91.5	23.9	120	8.0	87.5	2.0	105	0.0	0.0	36
South Atlantic	31.1	0.0	1766.9	16.3	16	4.9	90.7	1.6	85	0.0	0.0	57
East South Central	23.6	0.0	737.7	41.3	77	5.9	82.6	0.0	65	0.0	5.9	30
West South Central	60.3	0.0	89.0	14.3	14	17.2	91.8	5.7	86	0.0	0.0	11
Mountain	0.0	0.0	1872.0	16.3	163	0.0	97.7	16.3	114	0.0	16.3	0
Pacific	6.3	0.0	120.2	9.5	145	4.7	25.3	12.7	93	0.0	0.0	55
Total	15.4	0.2	205.1	12.6	124	8.4	76.3	3.4	90	0.0	1.2	65

PLAGUE INFECTION IN SAN LUIS OBISPO COUNTY, CALIF.

Under date of December 17, 1945, plague infection was reported proved on December 13 in a pool of 200 fleas from 26 ground squirrels, *C. beecheyi*, collected on a ranch at Santa Margarita, San Luis Obispo County, Calif.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 1, 1945.—During the week ended December 1, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		30		287	361	74	67	61	129	1,009
Diphtheria		1	5	50	6	2	2	2		68
Dysentery, bacillary				7						7
German measles				7	20		2	5	3	37
Influenza		5			34	1			5	45
Measles		4		194	1,021	1	8	10	72	1,310
Meningitis, meningococcus					2		1			3
Mumps		2	1	184	105	19	2	54	37	404
Poliomyelitis					1				3	4
Scarlet fever		15	9	163	129	13	6	23	25	383
Tuberculosis (all forms)		7	4	100	55	34	2	2	18	222
Typhoid and paratyphoid fever				20	3				1	24
Undulant fever					2					2
Venereal diseases:										
Gonorrhea	5	21	28	106	146	61	42	43	100	552
Syphilis	4	11	10	190	111	18	9	17	37	407
Whooping cough		9	3	241	71	9	1	7		341

CUBA

Habana—Communicable diseases—4 weeks ended December 8, 1945.—During the 4 weeks ended December 8, 1945, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	13	0	Tuberculosis	9	4
Malaria	9	0	Typhoid fever	14	2

Provinces—Notifiable diseases—4 weeks ended December 1, 1945.—During the 4 weeks ended December 1, 1945, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	0	1	4	11	0	14	30
Diphtheria	2	25	1	2	1	1	32
Hookworm disease		21					21
Leprosy	0	4	0	2	1	1	[2] 9
Malaria	5	18	5	2	23	116	169
Measles	0	0	0	0	1	0	1
Meningitis, cerebrospinal	1	0	0	0	0	0	1
Poliomyelitis	0	0	0	1	0	0	1
Rabies, human	0	1	0	0	0	0	1
Tetanus, infantile	1	0	0	0	0	0	1
Tuberculosis	11	29	14	32	23	64	173
Typhoid fever	24	41	4	30	24	52	175

[1] Including Habana City.
[2] Includes 1 case for the week ended December 1 for which the province was not given.

JAMAICA

Notifiable diseases—4 weeks ended November 17, 1945.—For the 4 weeks ended November 17, 1945, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1	1	Paratyphoid fever		1
Chickenpox	11	14	Scarlet fever	4	
Diphtheria	8	12	Tuberculosis, pulmonary	32	92
Dysentery, unspecified	14	13	Typhoid fever	11	167
Erysipelas	1		Typhus fever	1	1
Leprosy		1			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Typhus Fever

Belgian Congo.—For the week ended November 10, 1945, 186 cases of typhus fever (murine type) with 13 deaths were reported in Belgian Congo.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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Extent of Immunization Among Children of Farm Families

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Public Health Reports

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PHYSICAL IMPAIRMENTS OF MEMBERS OF LOW-INCOME FARM FAMILIES—11,490 PERSONS IN 2,477 FARM SECURITY ADMINISTRATION BORROWER FAMILIES, 1940 [1]

VI. EXTENT OF IMMUNIZATION AGAINST SMALLPOX, DIPHTHERIA, AND TYPHOID FEVER

By MARY GOVER, and JESSE B. YAUKEY, *Statisticians, United States Public Health Service*

Immunizations against smallpox, diphtheria, and typhoid fever have been in use for a considerable period and have been practiced on a relatively large proportion of the population. Immunizations against scarlet fever and whooping cough are of more recent development, and their use is not so universally urged by health authorities. Collins (*4*) reports about 4 percent of all children 10 years of age to have had artificial immunization against scarlet fever (1930); no quantitative statement regarding whooping cough vaccine is available. Although immunization against typhoid fever is infrequent in northern States it has been used extensively in southern rural areas.

This study is a quantitative statement of the extent of immunization procedures against smallpox, diphtheria, and typhoid fever among low-income farm families in the United States. The data are cumulative at specific ages, that is, they relate to the entire time prior to examination and are not a record of current annual immunizations. It is possible, however, to subtract successive cumulated rates and so obtain an estimated average annual rate of immunization for specific age groups.

The examined population, described in the first report of this series (*6*), resided in rural sections of eastern, central, and southern States and consisted of families of farmers in selected areas who had been

[1] From the Division of Public Health Methods, U. S. Public Health Service, in cooperation with the Farm Security Administration, Department of Agriculture. Mr. Yaukey is detailed to the Farm Security Administration.

This is the sixth in a series of papers dealing with physical defects found on examination of members of low-income farm families residing in 19 localities in the United States. The physical findings of the examinations were coded and transferred to punchcards by the Farm Security Administration under the direct supervision of Mr. Jesse B. Yaukey. The data were subsequently made available to the U. S. Public Health Service. Acknowledgment is made to Dr. S. D. Collins for critical suggestions and advice throughout the preparation of the studies.

granted rehabilitation loans by the Farm Security Administration. During the course of a general physical examination each person was asked whether he or she had ever been immunized against smallpox, diphtheria, and typhoid fever. No inquiry was made concerning the number of times immunized or the number of years since the last immunization.

Earlier studies made by this office on the frequency of immunization procedures specific for size of city and family income provide data for comparison with the frequency of immunization in low-income farm families. These studies were made from two sources: (*a*) A record of illness and medical services obtained by the Committee on the Costs of Medical care (*1, 2, 3*) and (*b*) a health record secured by the Communicable Disease Survey in a 1-day canvass in large cities (*5*). The survey made by the Committee on the Costs of Medical Care was a record of illness, immunization, physical examination, and medical services received during an observed 12-month period, 1928–31. The family roster and certain past history items were obtained on the initial visit to each family. The observed population consisted of the members of 9,000 white families in 130 localities in 18 States representing every size of community. The records were obtained by visiting nurses through the cooperation of local health organizations. The Communicable Disease Survey was conducted in the spring of 1936 and was a house-to-house canvass of 213,931 families in 28 cities of 100,000 population or more located in 19 States. A single visit was made to each household and information on illness and medical services was obtained usually from the housewife.

IMMUNIZATION AND LOCALITY

Table 1 shows in each of 19 localities the percentage of white children under 15 years of age in Farm Security Administration borrower families that had been immunized at any time against smallpox, diphtheria, and typhoid fever. Thirty percent of all children had been vaccinated against smallpox, 46 percent had been immunized against diphtheria, and 24 percent against typhoid fever. There is a wide range in the percentage of children immunized in the separate localities; from 5 to 63 percent for smallpox, from 30 to 74 percent for diphtheria; and from practically zero to 75 percent for typhoid fever. In this connection, column 4 of table 1 shows health organization facilities in counties as of June 1941 (*7*); "full time" indicates that the county had a local health officer or the services of a State or local district unit. Among the six northern counties there is no apparent association between organization of a county health department and extent of immunization found on examination of these farm children. However, among southern counties there is probably some slight

association which can scarcely account for the total variability. In southern counties, with and without organized health services, 35 and 22 percent of white children had been immunized against smallpox at some time since birth, and 50 and 36 percent against diphtheria, respectively.

TABLE 1.—*Percentage of white children under 15 years of age that had been immunized* [1] *against* smallpox, diphtheria, *and* typhoid fever—*members of Farm Security Administration borrower families in 19 localities, 1940.*

Geographic area	State	County	Health department services [2]	Known as to immunization	With prior immunization against— Smallpox	Diphtheria	Typhoid fever
				Number		*Percent* [3]	
Northeast	Maine	Aroostook	Full time	447	14.0	33.4	0.2
East North Central	Ohio	Champaign	Unorganized	176	19.9	37.5	.6
	Indiana	Montgomery	do	130	55.4	69.2	3.8
West North Central	Missouri	Callaway	Full time	281	10.7	42.7	6.8
	Nebraska	Howard	Unorganized	252	21.8	33.3	.8
Mountain	Colorado	Phillips	do	165	63.0	65.5	1.8
South Atlantic	Virginia	Spotsylvania	do	74	37.8	33.8	4.1
	North Carolina	Avery	Full time	99	43.4	48.5	34.3
	South Carolina	Kershaw	do	311	55.3	30.5	19.3
	Georgia	Worth	do	278	31.3	40.3	35.6
	Florida	Levy	do	205	17.6	63.9	29.3
East South Central	Tennessee	Henderson	do	240	10.0	40.0	75.8
	Mississippi	Carroll Leflore Humphreys	Unorganized Full time do	192	44.8	68.7	53.1
West South Central	Arkansas	Pope	do	324	43.8	32.4	30.6
	Oklahoma	Okfuskee	Unorganized	252	43.3	48.4	33.3
	Louisiana	Franklin	Full time	497	31.6	74.2	48.3
	Texas	Panola	Unorganized	117	5.1	31.6	9.4
	do	Williamson	do	146	10.3	29.5	3.4
	do	Runnels	do	123	13.0	38.2	5.7
19 localities				4,309	29.7	45.9	23.6

[1] Immunization at any time since birth.
[2] From Kratz (7). Health Department services as of June 1941.
[3] The range of the probable error of the percentage immunized against smallpox is from 1.1 to 3.8 percent; against diphtheria from 1.3 to 3.7 percent; against typhoid fever from 0.1 to 3.2 percent.

A slightly higher percentage of children in the South had been immunized than in the North;[2] the small differences in the percentage

[2] Rates based on the annual number of immunizations performed by State or county health departments and reported to the Public Health Service by State health departments are given in the following table. The rates do not represent the percentage of the population immunized; they are annual rates and, moreover, include immunizations done for the second time on the same individual and exclude all immunizations by private physicians.

Immunizations administered by State Health Departments, 1939–41

Immunization against—	United States	North	South	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
	Annual rate per 1,000 population											
Smallpox	10.3	5.7	18.1	2.1	4.7	5.7	8.5	17.2	21.9	16.3	16.7	6.0
Diphtheria	8.7	5.7	13.4	5.0	4.6	5.5	8.2	14.2	15.8	10.4	14.8	7.0
Typhoid fever	13.8	.9	36.6	.3	.2	.1	3.5	32.6	52.4	28.9	7.6	.6

immunized in North and South against both smallpox and diphtheria are statistically significant (table 2). The percentage of preschool children that had been immunized is higher in the North for smallpox and higher in the South for diphtheria. Immunization against typhoid fever is markedly higher in the South, particularly in areas where floods occur as in Tennessee (table 1).

TABLE 2.—*Percentage of white children under 15 years of age that had been immunized*[1] *against* smallpox, diphtheria, *and* typhoid fever *in Northern and Southern localities*[2]—*members of Farm Security Administration borrower families, 1940*

Age	Known as to immunization		With prior immunization against—					
			Smallpox		Diphtheria		Typhoid fever	
	North	South	North	South	North	South	North	South
	Number		Percent					
Under 15	1,447	2,862	24.7	32.2	42.6	47.7	2.1	34.5
Under 5	419	796	6.9	1.0	15.3	32.3	.2	7.9
5–9	495	980	25.9	30.0	46.1	49.3	1.6	34.5
10–14	533	1,086	37.7	57.1	60.8	57.4	4.1	54.0

[1] Immunization at any time since birth.
[2] The localities included are:
North: Aroostook County, Maine; Champaign County, Ohio; Montgomery County, Ind.; Callaway County, Mo.; Howard County, Nebr.; and Phillips County, Colo.
South: Spotsylvania County, Va.; Avery County, N. C.; Kershaw County, S. C.; Worth County, Ga.; Levy County, Fla.; Henderson County, Tenn.; parts of Carroll, Leflore, and Humphreys Counties, Miss.; Pope County, Ark.; Okfuskee County, Okla.; Franklin Parish, La.; and Panola, Williamson, and Runnels Counties, Tex.

TREND IN IMMUNIZATION

A trend in the immunization rate is of necessity reflected in the frequency of immunization based on the prior history of persons examined. From a comparison of survey data Collins (*5*) concluded that there had been no marked change in the rate of vaccination against smallpox between 1929 and 1935; while "the proportion of children immunized against diphtheria appears to have increased rather markedly" although "diphtheria immunizations administered by State Health Departments do not indicate large increases since 1937."

The Annual Report of the Department of Health of New York State (*9*) gives an interesting tabulation of immunizations against diphtheria performed by the department. The immunization rate for all ages combined declines, from 1926 to 1940, from approximately 2.5 to 1.2 percent for the State exclusive of New York City; urban rates are slightly higher than rural, and both show approximately the same rate of decline. Specific for age, however, the annual rate at which immunizations were performed has been increasing at ages

under 5 years and decreasing over 5 years of age in both urban and rural areas. In other words, the percentage of total immunizations done under 5 years of age has increased; from approximately 20 to 70 percent in urban areas, and from 20 to 60 percent in rural areas, 1926 to 1940. This is in agreement with the recommendation of health organizations that immunization, particularly against diphtheria, be performed at early ages when the death rate is relatively high. In recent years the most conspicuous change in immunization against diphtheria has been this shift to younger ages, although some areas would probably still show an increase in the rates for all ages.

Mississippi State Health Department reports (*8*) also give the annual number of immunizations performed by the State and county health departments. The annual rate of immunization against diphtheria during the last decade was approximately 2 to 3 percent of the total population with about 70 percent of immunizations performed under 5 years of age in counties with organized health services. The rate of vaccination against smallpox shows an association with the establishment of local health departments. Approximately one-third of Mississippi counties have had the services of full-time health officers since 1930 or earlier; another one-third of the counties have had organized health departments since 1930; and the remaining one-third are unorganized counties. In unorganized counties the vaccination rate is approximately 1 percent or less except in epidemic years; while in counties with well-established health departments and in those with recently organized health services the vaccination rate is approximately 3 to 4 percent of the total population annually.

VACCINATION AGAINST SMALLPOX

Figure 1 shows the percentage of children of specific ages that had been vaccinated against smallpox as obtained in three comparable surveys; rates are plotted on semilogarithmic paper for the Farm Security Administration examinations, the Communicable Disease Survey (exclusive of the West) and the Committee on the Costs of Medical Care survey. For all three curves (fig. 1) the percentage vaccinated increases rapidly under 2 years of age, and continues to increase at a slightly less rapid rate until the age of school entrance, 6 to 7 years. The farm children examined by the Farm Security Administration differ from the children of the Committee on the Costs of Medical Care (urban and rural) and Communicable Disease (urban) surveys in having a relatively smaller percentage vaccinated under 1 year of age and an increasing percentage vaccinated during school ages, 7 to 15 years. At 15 years of age approximately 60 percent of Farm Security Administration children and 65 percent of children reported upon by the Committee on the Costs of Medical Care have been vaccinated against smallpox at some time since birth; the Communicable Disease

Survey of children in large cities shows approximately 90 percent had been vaccinated by the time they had reached 15 years of age.

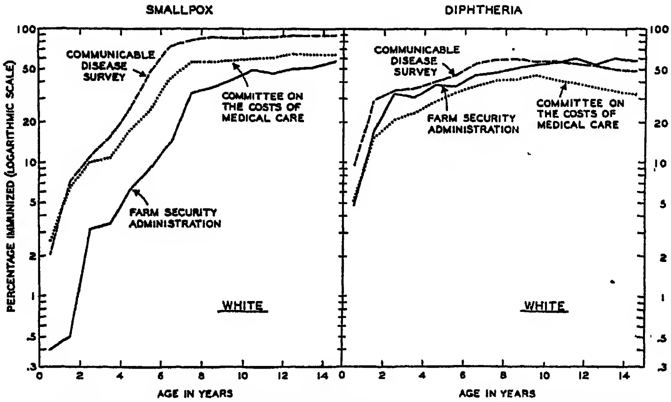

FIGURE 1.—Percentage of children of specific ages that had been immunized against smallpox and diphtheria at any time prior to examination. Farm Security Administration physical examinations, 1940, and comparable data (*1*, *2*, *5*). (The Communicable Disease Survey data are exclusive of the West.)

The frequency of vaccination against smallpox varies markedly with size of city and slightly with income and section of the country (*1*). In

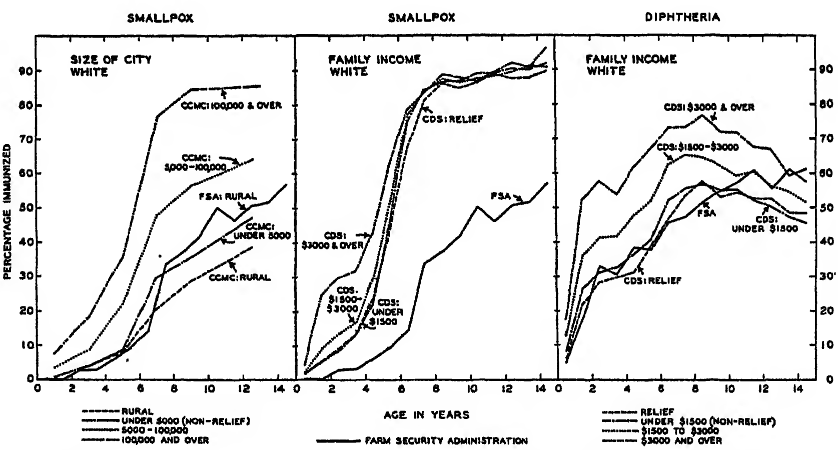

FIGURE 2a.—Percentage of children of specific ages in urban and rural areas that had been vaccinated against smallpox at any time prior to examination. Farm Security Administration physical examinations, 1940, and Committee on the Costs of Medical Care (*1*).

FIGURE 2b.—Percentage of urban children of specific ages by family income and of rural children of rehabilitation borrower families that had been immunized against smallpox at any time prior to examination. Farm Security Administration physical examinations, 1940, and Communicable Disease Survey (*5*), exclusive of the West.

FIGURE 2c.—Percentage of urban children of specific ages by family income and of rural children of rehabilitation borrower families that had been immunized against diphtheria at any time prior to examination. Farm Security Administration physical examinations, 1940, and Communicable Disease Survey (*5*), exclusive of the West.

the Costs of Medical Care study smallpox vaccination is approximately twice as frequent in large cities as in rural areas, 84 and 42 percent,

respectively, at 15 years of age. Figure 2 shows the percentage of children in specific age groups that had been vaccinated against smallpox for children of Farm Security Administration borrower families compared with children of the Committee on the Costs of Medical Care Survey in rural areas and three size-of-city groups. Smallpox vaccination is obviously less frequent among the Farm Security Administration farm families than among canvassed families living in cities of 5,000 or more population; and is about the same as among canvassed families in small towns and rurals areas. The somewhat higher percentage vaccinated for Farm Security Administration farm children than for the Committee on the Costs of Medical Care rural children may be largely accounted for by the greater representation of

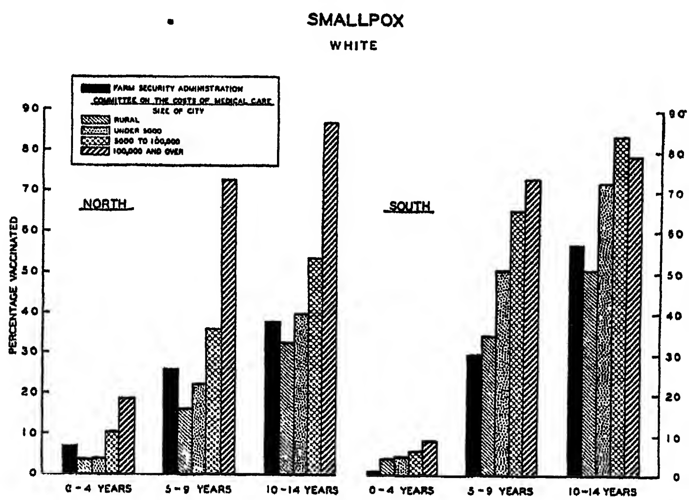

FIGURE 3.—Percentage of children of specific ages in urban and rural areas of North and South that had been vaccinated against smallpox at any time prior to examination. Farm Security Administration physical examinations, 1940, and Committee on the Costs of Medical Care (*1*).

the South among the rural rehabilitation families, where the percentage vaccinated is slightly higher (table 2 and fig. 3).

Figure 2 also shows the percentage of children in specific age groups that had been vaccinated against smallpox for children of Farm Security Administration families compared with children in families of 4 income groups in cities of 100,000 or more population. The only significant difference among the city curves is the higher percentage of children vaccinated under 5 years of age in families of $3,000 or more family income. Children of rural farm families have a lower percentage vaccinated than children of families of any income level among city populations.

Except for cities of 100,000 and over in population the South shows a higher percentage vaccinated than the North (*1*) (fig. 3). For each of three age groups the frequency of vaccination among children of

Farm Security Administration borrower families in the North is about equivalent to that of children in rural areas or small towns as recorded in the Committee on the Costs of Medical Care Survey for the North and about equal to that in rural areas for the South (fig. 3).

Boys and girls (table 3) show practically identical age-specific percentages vaccinated against smallpox. Under 6 years of age, the

TABLE 3.—*Percentage of white children at specific ages that had been immunized* [1] *against* smallpox, diphtheria, *and* typhoid fever—*members of Farm Security Administration borrower families in a total of 19 localities,* [2] *1940*

Age	Known as to immunization			With prior immunization against—								
				Smallpox			Diphtheria			Typhoid fever		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male*	Female	Both sexes	Male	Female
	Number			Percent								
Under 15	4,300	2,194	2,115	29.7	30.1	29.2	45.8	46.6	45.0	23.6	24.9	22.3
Under 1	224	100	124	.4	------	.8	4.9	3.0	6.5	.9	1.0	.8
Do	202	93	109	.5	------	.9	17.8	16.1	19.3	.5	------	.9
Under 2	253	127	126	3.2	2.4	4.0	33.2	34.6	31.7	4.0	3.9	4.0
Under 3	260	130	130	3.5	2.3	4.6	30.8	31.5	30.0	4.2	4.6	3.8
Under 4	276	138	138	6.5	6.5	6.5	38.8	43.5	34.1	14.5	14.5	14.5
Under 5	277	141	136	9.7	10.6	8.8	37.9	32.6	43.4	13.0	10.6	15.4
Under 6	285	154	131	14.4	14.9	13.7	46.0	46.8	45.0	17.9	16.9	19.1
Under 7	313	178	135	33.9	33.7	34.1	47.6	48.9	45.9	25.6	27.5	23.0
Under 8	303	144	159	37.3	40.3	34.6	52.1	57.6	47.2	27.7	25.7	29.6
Under 9	297	150	147	42.1	44.0	40.1	54.9	56.7	53.1	31.6	31.3	32.0
Under 10	328	153	175	50.3	50.3	50.3	57.6	58.2	57.1	34.1	34.6	33.7
Under 11	326	151	175	46.6	49.0	44.6	61.0	62.9	59.4	34.4	43.7	26.3
Under 12	325	188	137	50.8	48.4	54.0	55.7	54.8	56.9	41.5	41.5	41.6
Under 13	319	171	148	51.7	50.3	53.4	61.4	60.2	62.8	36.7	40.9	31.8
Under 14	321	176	145	57.0	54.5	60.0	57.9	55.1	61.4	41.1	41.5	40.7

[1] Immunization at any time since birth. [2] The 19 localities are listed in table 1.

percentages of Negro and white children that have been vaccinated are the same; at 6 years of age and over, however, there are approximately 35 percent more white children who have been vaccinated than Negro (table 4 and fig. 4).

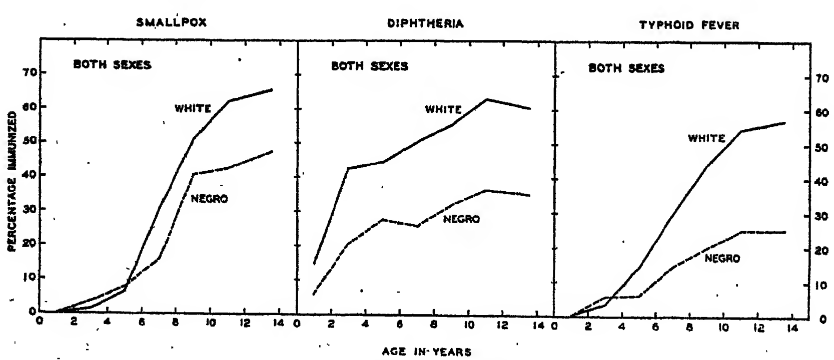

FIGURE 4.—Percentage of Negro and white children of specific ages that had been immunized against smallpox, diphtheria, and typhoid fever at any time prior to examination. Farm Security Administration physical examinations, 1940, in southern localities where both Negroes and whites were examined.

TABLE 4.—*Percentage of Negro and white children in specific age groups that had been immunized* [1] *against* smallpox, diphtheria, *and* typhoid fever—*members of Farm Security Administration borrower families in a total of 9 localities,* [2] *1940*

Age	Known as to immunization			With prior immunization against—								
				Smallpox			Diphtheria			Typhoid fever		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
	Number			Percent								
	Negro											
Under 15	795	397	398	26.5	27.2	25.9	28.2	24.2	32.2	15.7	16.6	14.8
0- 1	69	39	30	------	------	------	5.8	10.3	------	------	------	------
2- 3	93	34	59	3.2	2.9	3.4	20.4	11.8	25.4	5.4	2.9	6.8
4- 5	102	50	52	7.8	6.0	9.6	27.5	18.0	36.5	5.9	4.0	7.7
6- 7	124	61	63	16.1	14.8	17.5	25.8	26.2	25.4	14.5	18.0	11.1
8- 9	106	52	54	40.6	38.5	42.6	32.1	25.0	38.9	19.8	25.0	14.8
10-11	113	62	51	42.5	43.5	41.2	36.3	29.0	45.1	24.8	19.4	31.4
12-14	188	99	89	47.3	48.5	46.1	35.1	32.3	38.2	25.0	27.3	22.5
	White											
Under 15	2,250	1,143	1,107	36.6	37.1	36.0	50.1	50.6	49.7	33.7	35.1	32.2
0- 1	217	97	120	------	------	------	14.7	12.4	16.7	------	------	------
2- 3	258	121	137	1.2	------	2.2	42.6	45.5	40.1	3.5	3.3	3.6
4- 5	296	154	142	6.1	6.5	5.6	44.6	40.9	48.6	14.2	11.7	16.9
6- 7	323	181	142	30.7	29.8	31.7	50.2	49.2	51.4	29.7	30.9	28.2
8- 9	304	144	160	51.3	56.9	46.3	55.6	59.0	52.5	44.1	42.4	45.6
10-11	319	149	170	62.1	61.7	62.4	63.0	63.8	62.4	54.2	59.1	50.0
12-14	533	297	236	65.5	62.6	69.1	60.4	60.3	60.6	57.0	58.6	55.1

[1] Immunization at any time since birth.
[2] The 9 localities are: Spotsylvania County, Va.; Kershaw County, S. C.; Worth County, Ga.; Levy County, Fla.; parts of Carroll, Leflore, and Humphreys Counties, Miss.; Pope County, Ark.; Okfuskee County, Okla.; Franklin Parish, La.; and Panola County, Tex.

IMMUNIZATION AGAINST DIPHTHERIA

Figure 1 shows the frequency of diphtheria immunization for specific ages under 15 years as obtained in three comparable surveys, plotted on semilogarithmic paper. The rate of increase in the percentage immunized is most rapid under 2 years of age; after 2 years of age it continues to increase at a less rapid and practically constant rate until 15 years of age. In both the Committee on the Costs of Medical Care and Communicable Disease Surveys the percentage immunized against diphtheria declines somewhat after approximately 9 or 10 years of age, while in the Farm Security Administration data the percentage immunized continues to increase. The decline in the rate in the two former surveys is probably due partly to the fact that practically all of the children were reported upon and frequently not by their parents, whereas the children examined by the Farm Security Administration either reported upon themselves or were reported upon by their parents. The percentage of children ever immunized also reflects a changing immunization rate; that is, 10-year-old children,

particularly in cities, may have lived their first years at a time when immunization was performed less frequently than 5 years later, for example.

The frequency of immunization against diphtheria has been shown to vary somewhat with section of the country but to be the same in rural and urban areas (*2*). For ages under 15 years the frequency of immunization against diphtheria shows a definite relationship with income (*2*, *5*). Figure 2 gives the percentage of children of low-income farm families that had been immunized compared with the percentages of children immunized in four income groups as obtained by the Communicable Disease Survey in large cities. The West

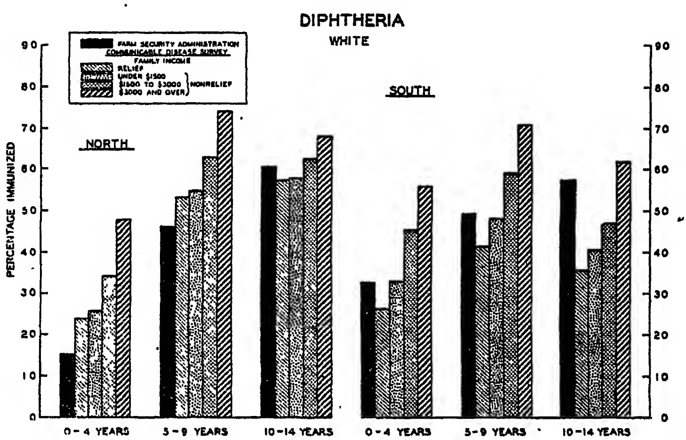

FIGURE 5.—Percentage of urban children of specific ages by family income in North and South and of rural children of rehabilitation borrower families in North and South that had been immunized against diphtheria at any time prior to examination. Farm Security Administration physical examinations, 1940, and Communicable Disease Survey (*5*). Data by section and income are unpublished.

section has been omitted from the urban survey since western States are not represented in the Farm Security Administration examinations. The frequency of immunization among children of the Farm Security Administration borrower families is about equal to that in the two lower income groups (relief, and nonrelief under $1,500) in large cities. At 9 years of age, or prior to the decline in the urban percentages, 55 percent of children of rural borrower families had been immunized against diphtheria; while 53 and 55 percent of the children in low-income levels (relief, and nonrelief under $1,500) in large cities had been immunized. In northern areas (fig. 5) children of Farm Security Administration borrower families show a somewhat lower percentage immunized against diphtheria in the age groups 0–4 and 5–9 years than urban children in low-income groups; in southern areas (fig. 5) they show a slightly higher percentage immunized in all three age groups under 15 years.

Tables 3 and 4 and figure 4 give the percentages of boys and girls and of Negro and white children that had been immunized against diphtheria. Boys and girls show the same percentage immunized in specific age groups; white children show a higher percentage immunized than Negro children for the nine southern localities in which Negroes were examined. Under 4 years of age more than twice as many white as Negro children have been immunized against diphtheria; while from 4 to 15 years of age approximately 70 percent more white than Negro children have been immunized at some time.

IMMUNIZATION AGAINST TYPHOID FEVER

Typhoid fever immunization has been performed, on the whole, in areas where the typhoid problem is the greatest, that is, in small

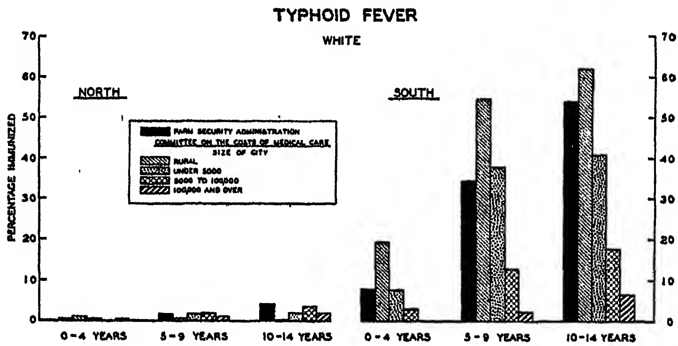

FIGURE 6.—Percentage of children of specific ages in urban and rural areas of North and South that had been immunized against typhoid fever at any time prior to examination. Farm Security Administration physical examinations, 1940, and Committee on the Costs of Medical Care (*3*).

towns and rural areas of the South (*3*). The Committee on the Costs of Medical Care survey shows that "the South, with the highest percentage of persons with a history of typhoid fever, has resorted to immunization far more than any other section. In cities over 100,000, immunizations are not much more frequent in the South than elsewhere; the excess for the South is particularly large for small towns and rural areas." At 10–14 years of age approximately 50 percent of children in southern localities have been immunized against typhoid fever among both the rural Farm Security Administration families and families in small towns and rural areas surveyed by the Committee on the Costs of Medical Care (fig. 6). The Communicable Disease Survey in large cities (*4*) shows a direct relationship between immunization for typhoid fever and size of family income; at 10–14 years, however, slightly less than 6 percent of urban children had been immunized in the $3,000 and over income group.

Table 3 shows an equal percentage of boys and girls immunized against typhoid fever at specific ages. Among Negroes and whites,

however (table 4 and fig. 4), twice as many white children have been immunized as Negro, or 25 and 57 percent immunized, respectively, at 12–14 years of age in localities where Negroes were examined.

SUMMARY

The frequency of immunization at any time since birth against smallpox, diphtheria, and typhoid fever for children of Farm Security Administration borrower families residing in 19 localities was obtained during the course of general physical examination of rehabilitation farm families. There is marked variability in the percentage of children immunized in the several localities which, in the South at least, may be associated to some extent with the organization of local health departments.

Smallpox vaccination varies slightly with income and section of the country and markedly with size of city, vaccination rates being higher in large cities. At 10–14 years of age 57 percent of children of Farm Security Administration rural borrower families in southern areas had been vaccinated against smallpox, which agrees roughly with the percentage vaccinated in rural areas as reported in the Committee on the Costs of Medical Care survey, namely, 51 percent in rural areas, 72 percent in small towns, 84 percent in towns of 5,000 to 100,000 population, and 79 percent in towns of 100,000 or more population, in surveyed southern areas.

Immunization against diphtheria is not associated with size of city, but varies slightly with geographic section and markedly with size of family income. At 5–9 years of age 49 percent of children of rural borrower families in southern areas had been immunized as compared with 41, 48, 59, and 71 percent of children in families on relief and with incomes under $1,500, $1,500–$3,000, and $3,000 and over, respectively, in large cities of the South canvassed by the Communicable Disease Survey.

Typhoid fever immunization has been performed mainly in areas where typhoid fever is a real problem, that is, in small towns and rural areas of the South. At 10–14 years of age approximately 50 percent of children in southern localities have been immunized against typhoid fever among both rural Farm Security Administration borrower families and families in small towns and rural areas surveyed by the Committee on the Costs of Medical Care.

The three immunization procedures considered were performed as frequently on boys as girls in these data. The percentage of Negro children immunized is less than the white. At 12–14 years of age approximately 40, 70, and 125 percent more white than Negro children had been immunized at some time since birth against smallpox, diphtheria, and typhoid fever, respectively.

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

December 2–29, 1945

The accompanying table 1 summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended December 29, 1945, the number reported for the corresponding period in 1944, and the median number for the years 1940–44.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—For the 4 weeks ended December 29 there was a total of 319,576 cases reported in the 46 States, the District of Columbia, and New York City reporting influenza to the Public Health Service. A comparison of this figure with prior years indicates that it is far above the corresponding period of 1942 and 1944 but roughly the same as in December of 1943 when the last preceding epidemic occurred. Influenza virus B has been identified in a number of laboratories during and preceding the present epidemic.

TABLE 1.—*Number of reported cases of 9 communicable diseases in the United States during the 4-week period December 2–29, 1945, the number for the corresponding period in 1944, and the median number of cases reported for the corresponding period, 1940–44*

Division	Current period	1944	5-year median	Current period	1944	5-year median	Current period	1944	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,819	1,517	1,369	319,576	11,556	11,556	10,381	3,092	18,868
New England	50	33	33	498	102	50	765	320	1,919
Middle Atlantic	95	111	131	729	32	115	2,930	349	5,849
East North Central	282	181	181	7,122	135	341	1,969	295	1,655
West North Central	146	214	94	33,904	84	157	435	253	1,409
South Atlantic	416	206	248	49,663	2,588	3,755	563	216	922
East South Central	205	166	146	124,382	389	662	666	131	603
West South Central	415	332	304	59,697	7,444	7,444	316	253	458
Mountain	147	51	51	42,055	632	1,016	685	111	1,300
Pacific	63	423	116	1,526	150	418	2,052	1,164	1,164
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	498	761	490	458	382	260	10,391	14,749	11,821
New England	20	39	39	23	12	12	744	1,601	1,250
Middle Atlantic	115	195	109	52	153	33	1,902	2,641	2,387
East North Central	99	159	54	100	50	32	2,883	3,704	3,351
West North Central	34	46	21	45	41	19	898	1,386	1,352
South Atlantic	56	87	87	43	29	26	1,089	1,550	1,148
East South Central	54	55	19	23	11	11	504	677	677
West South Central	43	69	23	34	15	20	713	664	388
Mountain	13	25	25	21	11	11	530	837	640
Pacific	64	86	71	117	60	39	1,128	1,689	650
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	23	28	70	207	217	324	7,297	7,000	12,019
New England	0	0	0	11	17	16	1,109	1,068	1,326
Middle Atlantic	0	0	0	29	36	36	2,024	1,820	3,266
East North Central	4	10	18	30	23	30	1,671	1,218	3,076
West North Central	5	9	10	4	8	14	189	306	541
South Atlantic	0	1	1	32	49	49	825	932	1,126
East South Central	5	2	3	20	14	32	187	148	401
West South Central	4	4	13	57	36	48	529	691	691
Mountain	4	2	2	12	13	14	225	251	331
Pacific	1	0	0	12	21	21	538	566	892

[1] Mississippi and New York excluded; New York City included. In a number of States the reports seem to rgpresent estimates or the results of artificial stimulation to obtain more complete reports during the epidemic.
[2] Mississippi excluded.

Influenza is so incompletely reported that many States send to the Public Health Service estimates based on various types of supplementary information, rather than actual cases reported by attending physicians. Other States send letters to physicians or by published appeals stimulate the reporting of cases. Thus in one week roughly two-thirds of all reported cases were reported by one State and this one report has an overwhelming influence on locating the peak week for the country as a whole. To avoid such situations, table 2 of reported cases by weeks is based on 37 States, the District of Columbia, and New York City in which reporting has been reasonably consistent in the various weeks before and during the epidemic. It will be noted that totals are far below those quoted above; the table is shown solely for judging the progress of the epidemic in different geographic sections.

Table 2 indicates that for the country as a whole the rise began around the middle of November with a peak for the week ending December 22, the two succeeding weeks being definitely below the peak.

The peak of reported cases comes rather definitely in the week ending December 22 in nearly all geographic sections except the East South Central and the Pacific in which the cases are almost the same in the week ending December 29 as in the preceding week. So few cases have been reported in the New England States that the indicated peak in the week of December 15 is not reliable.

TABLE 2.—*Influenza cases reported by geographic sections by weeks in 1945–46 and in corresponding weeks of preceding years—including only States reporting consistently before and during the epidemic*

Geographic section	Week ended— 1945 Nov. 3	Nov. 10	Nov. 17	Nov. 24	Dec. 1	Dec. 8	Dec. 15	Dec. 22	Dec. 29	1946 Jan. 5
37 States,[1] District of Columbia, and New York City:										
1945–46	2,611	2,720	4,022	4,957	11,329	22,650	29,332	42,828	33,460	33,893
1944–45	1,608	1,290	1,829	1,748	2,117	2,423	2,893	2,689	3,439	4,545
1943–44	1,414	1,537	1,700	2,441	4,395	11,321	38,982	55,015	84,701	86,784
1942–43	1,549	1,567	1,742	1,822	1,890	2,552	2,382	2,182	3,325	3,709
New England:										
1945–46	9	0	5	4	1	3	37	24	24	560
1944–45	21	33	14	24	28	26	24	20	21	58
1943–44	3	1	3	32	54	121	342	929	830	457
1942–43	3	15	4	3	9	3	4	3	11	36
Middle Atlantic:										
1945–46	6	10	11	10	45	45	164	264	256	252
1944–45	10	5	7	3	4	7	9	7	9	8
1943–44	14	7	24	11	36	133	564	889	526	225
1942–43	22	37	20	25	31	31	23	25	42	51
East North Central:										
1945–46	50	54	279	384	1,309	1,418	1,045	2,601	1,564	1,675
1944–45	12	29	19	15	36	35	15	25	35	36
1943–44	30	159	33	29	121	926	2,995	3,250	3,095	3,594
1942–43	52	45	65	50	41	52	105	48	94	107
West North Central:										
1945–46	9	12	21	29	142	623	159	561	200	850
1944–45	1	16	19	1	8	5	21	11	13	14
1943–44	1	8	8	422	382	533	708	206	480	312
1942–43	4	8	8	3	12	23	36	9	2	68
South Atlantic:										
1945–46	711	678	1,393	1,623	3,953	10,147	12,264	15,142	12,110	11,194
1944–45	505	444	551	594	514	578	646	622	742	1,216
1943–44	428	446	507	649	1,227	4,035	15,920	16,425	35,978	32,635
1942–43	539	637	674	811	559	1,042	798	691	1,224	1,561
East South Central:										
1945–46	48	47	323	246	477	661	853	1,599	1,661	3,178
1944–45	28	40	34	31	82	78	80	102	118	430
1943–44	91	67	85	110	425	501	1,277	2,555	8,775	6,160
1942–43	59	49	81	42	87	120	80	199	212	195
West South Central:										
1945–46	1,672	1,769	1,777	2,178	4,551	8,297	12,587	17,687	13,760	14,191
1944–45	908	604	1,064	945	1,280	1,541	1,896	1,668	2,318	2,544
1943–44	666	694	800	970	1,511	3,549	8,971	15,504	21,550	33,226
1942–43	655	623	671	628	902	1,004	993	958	1,455	1,410
Mountain:										
1945–46	92	137	196	453	802	1,361	2,076	4,258	3,293	1,288
1944–45	97	97	82	101	132	107	162	198	154	190
1943–44	142	137	218	179	578	1,337	4,770	6,188	6,007	5,139
1942–43	168	101	156	197	198	206	275	202	234	230
Pacific:										
1945–46	14	13	17	30	49	95	147	692	592	705
1944–45	25	22	39	34	33	46	40	35	29	49
1943–44	39	18	22	39	61	96	3,435	9,069	7,460	5,036
1942–43	47	52	63	63	51	71	68	47	51	51

[1] States excluded are those reporting such unusually large numbers of cases as to indicate estimates or large sudden changes in the completeness of reporting.

Reported cases indicate that the incidence started to rise during the second or third week of November in Indiana, South Carolina, and

Texas; the two latter States commonly report many more cases than other States but the rise mentioned refers to cases in excess of the usual level of reporting. If the epidemic did start in the middle sections of the country and almost simultaneously in several States, its rapid spread to other sections would be expected, so the single peak in nearly all regions is not unreasonable. The 1920 epidemic started in the Great Lakes region and very quickly spread to all parts of the country. During the week ended January 5, the latest data available, there were 33,893 cases reported.

Thus far there has been very little mortality. Data are not available on deaths credited to influenza and pneumonia, but deaths from all causes in 93 large cities as released by the United States Bureau of the Census indicates an excess over the average for the same period in 1942 and 1944 of 9.9 percent during the 4 weeks ending December 29, and 13.6 percent during the 2 weeks ending December 29, 1945. There is nearly always some excess mortality during an influenza epidemic, no matter how mild the cases. In December of 1943 influenza was epidemic and the number of deaths was greater than in the current 4-week period.

Diphtheria.—For the 4 weeks ended December 29 there were 1,819 cases of diphtheria reported, as compared with 1,517 in 1944 and a 5-year median of 1,369 cases. For the country as a whole the current incidence was the highest for this period since 1941 when 1,830 cases were reported. Each section of the country except the Middle Atlantic and Pacific reported excesses over the normal (median) seasonal expectancy, the increases ranging from 1.4 times the median in the East South Central section to 2.9 times the median in the Mountain section.

Meningococcus meningitis.—The number of cases of meningococcus meningitis rose from 397 during the preceding 4 weeks to 498 for the 4 weeks ended December 29. The number of cases was, however, only about 65 percent of the 1944 figure for these weeks and was about the same as the 1940–44 median (490 cases). Each section of the country reported a decline from the 1944 figures, but only 4 of the 9 sections showed a decline from the preceding 5-year median.

Poliomyelitis.—The number of cases of poliomyelitis dropped from 932 during the 4 weeks ended December 1 to 458 during the current 4-week period. The incidence was, however, 20 percent above the 1944 figure and about 80 percent above the 1940–44 median. Each section of the country contributed to the relatively high incidence of this disease, the largest excesses over the normal seasonal incidence occurring in the East North Central and Pacific sections.

DISEASES BELOW MEDIAN PREVALENCE

Measles.—For the 4 weeks ended December 29 there were 10,381 cases of measles reported, as compared with 3,092 for the corresponding

period in 1944 and a 5-year median of 18,868 cases. The incidence was higher in all sections of the country than in 1944, but only 3 sections, the East North Central, East South Central, and Pacific, reported excesses over the preceding 5-year medians. The greatest declines from the normal seasonal incidence were reported from the North Atlantic and West North Central sections, and the greatest increase over the median was reported from the Pacific section.

Scarlet fever.—The incidence of this disease was the lowest on record for this period. The number of cases (10,391) was about 70 percent of the number reported in 1944, and less than 90 percent of the 1940–44 median. The West South Central and Pacific sections reported increases over the normal seasonal expectancy, but in all other sections the incidence was relatively low.

Smallpox.—The smallpox incidence was also the lowest on record for this period. The 23 cases reported for the current 4 weeks was below even the low level of 1944 and was less than 35 percent of the preceding 5-year median. Significant decreases in the incidence were reported from areas normally reporting a high incidence.

Typhoid and paratyphoid fever.—The number of cases (207) of typhoid fever was slightly below the 1944 figure for this period, but it was only about 65 percent of the 1940–44 median. In the West South Central section the number of cases (57) was higher than the normal seasonal expectancy and in the East North Central and Mountain sections the incidence was about normal but in all other sections the disease was less prevalent than in preceding years.

Whooping cough.—For the 4 weeks ended December 29 there were 7,297 cases of whooping cough reported as compared with a seasonal expectancy of approximately 12,000 cases. The North Atlantic, East North Central, and East South Central sections reported more cases than occurred during the corresponding period in 1944, but none of the 9 geographic sections reported any excess over the 1940–44 median. The greatest declines from the seasonal expectancy were reported from the Middle Atlantic and East North Central sections.

MORTALITY, ALL CAUSES

For the 4 weeks ended December 29 there were 41,896 deaths from all causes reported to the Bureau of the Census by 93 large cities. In the years 1944, 1943, and 1942 the deaths for the corresponding period totaled 37,947, 49,108, and 38,280, respectively. The current number of deaths represented an increase of about 10 percent over the number reported for this period in 1944, but it was only about 0.2 percent above the 1942–44 average, which includes the 1943 influenza epidemic. A further discussion of mortality in large cities is found under the subject of influenza.

DEATHS DURING WEEK ENDED DECEMBER 29, 1945

[From the Weekly Mortality index, issued by the Bureau of Census, Department of Commerce]

	Week ended Dec. 29, 1945	Corresponding week, 1944
Data for 93 large cities of the United States:		
Total deaths	11,384	9,934
Average for 3 prior years	11,549	
Total deaths, 52 weeks of year	471,714	468,773
Deaths under 1 year of age	602	608
Average for 3 prior years	687	
Deaths under 1 year of age, 52 weeks of year	31,573	32,113
Data from industrial insurance companies:		
Policies in force	67,190,360	66,891,064
Number of death claims	7,789	10,500
Death claims per 1,000 policies in force, annual rate	6.0	8.2
Death claims per 1,000 policies, 52 weeks of year, annual rate	9.9	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 5, 1946

Summary

A total of 48,041 cases of influenza was reported, as compared with 52,947 last week, 4,587 and 126,610 for the corresponding weeks, respectively, of 1945 and 1944. Increases occurred in the New England, North Central, West South Central, and Pacific areas. States showing the largest increases are Alabama (1,279), Kansas (1,119), Texas (850), Utah (745), Nebraska (675), and Connecticut (545). Current reports for Nebraska, Texas, and Utah, however, are less than for the week ended December 22. Decreases occurred in 5 of the 12 States reporting currently more than 1,000 cases each, as follows (last week's figures in parentheses): *Increases*—Wisconsin 1,494 (1,034), Kansas 3,705 (2,586), West Virginia 2,356 (2,302), Alabama 2,497 (1,218), Oklahoma 2,245 (1,176), Texas 11,510 (10,660), Utah 1,114 (369); *decreases*—Virginia 5,323 (5,907), South Carolina 3,017 (3,243), Kentucky 1,953 (8,071), Arkansas 1,204 (1,924), Louisiana 6,314 (7,225).

Since September 29 a total of 401,982 cases has been reported, as compared with 29,985 and 461,940, respectively, for the corresponding periods ended with the first weeks of January 1945 and 1944.

Of the total of 189 cases of meningococcus meningitis reported, as compared with 162 last week and 238 for the corresponding week last year, 73 occurred in 5 States, as follows (last week's figures in parentheses): New York 14 (13), New Jersey 15 (10), Ohio 10 (8), Texas 13 (13), California 21 (14).

Deaths registered in 93 large cities of the United States during the week totaled 11,928, as compared with 11,399 for the preceding week, 9,786 for the corresponding week last year, and a 3-year (1943–45) average of 11,353.

Telegraphic morbidity reports from State health officers for the week ended January 5, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945	
NEW ENGLAND												
Maine	0	0	0	2	1	1	12	6	37	0	2	2
New Hampshire	1	0	0	3	------	------	------	1	11	0	1	0
Vermont	1	0	0	32	1	24	3	18	18	0	1	0
Massachusetts	4	7	5	------	------	------	236	61	384	5	8	8
Rhode Island	0	0	0	------	55	25	------	5	7	0	0	0
Connecticut	3	4	0	558	2	10	21	14	32	2	5	2
MIDDLE ATLANTIC												
New York	15	9	15	[1] 78	(1)	[1] 17	316	57	670	14	22	22
New Jersey	6	1	3	155	5	20	26	12	346	15	19	11
Pennsylvania	10	16	16	19	3	3	------	47	1121	7	10	10
EAST NORTH CENTRAL												
Ohio	48	11	11	175	7	26	23	12	95	10	11	8
Indiana	13	7	13	124	4	49	38	5	42	4	4	2
Illinois	17	4	16	49	4	18	327	34	169	9	25	6
Michigan [2]	2	3	3	8	------	6	52	6	83	0	1	1
Wisconsin	7	0	1	1,494	28	62	45	33	303	2	5	2
WEST NORTH CENTRAL												
Minnesota	4	13	2	8	------	1	4	4	6	1	3	0
Iowa	9	5	5	59	------	2	16	21	50	5	2	2
Missouri	3	9	3	23	3	10	41	2	27	5	11	7
North Dakota	2	10	8	25	8	49	1	1	10	0	2	1
South Dakota	0	1	3	------	------	------	10	9	9	0	1	0
Nebraska	2	10	4	819	11	11	14	11	11	0	1	1
Kansas	10	10	4	3,705	2	9	93	16	64	1	1	2
SOUTH ATLANTIC												
Delaware	0	0	1	------	------	------	2	2	6	2	0	0
Maryland [2]	13	1	5	69	6	11	10	5	13	6	5	5
District of Columbia	0	0	0	10	1	6	2	5	5	2	1	1
Virginia	19	2	13	5,323	398	659	85	8	146	9	4	4
West Virginia	3	3	7	2,356	59	59	4	61	61	6	2	2
North Carolina	37	13	13	------	------	12	53	8	69	8	8	3
South Carolina	7	7	7	3,017	688	688	61	11	33	3	4	4
Georgia	13	9	9	411	62	181	19	2	8	2	2	2
Florida	6	12	7	8	2	15	19	3	8	5	2	1
EAST SOUTH CENTRAL												
Kentucky	4	2	4	1,953	2	2	119	5	66	4	4	2
Tennessee	10	10	4	681	17	89	22	39	39	4	6	6
Alabama	8	13	7	2,497	413	413	9	6	23	4	9	4
Mississippi [2]	14	13	5	------	------	------	------	------	------	1	5	2
WEST SOUTH CENTRAL												
Arkansas	13	6	7	1,204	123	192	12	8	39	0	4	0
Louisiana	16	8	9	6,314	21	21	6	12	11	0	1	1
Oklahoma	8	7	5	2,245	171	187	31	15	7	3	2	2
Texas	67	66	46	11,510	2,250	2,250	91	90	90	13	9	3
MOUNTAIN												
Montana	1	1	1	350	31	31	2	2	38	0	0	0
Idaho	3	2	0	79	2	2	100	2	2	1	1	1
Wyoming	3	0	0	6	------	54	3	------	10	0	0	0
Colorado	4	4	6	195	25	62	59	8	92	5	2	1
New Mexico	3	13	1	1	------	6	------	2	10	2	1	0
Arizona	7	3	1	657	132	195	6	3	20	1	0	2
Utah [2]	0	0	0	1,114	1	32	72	14	14	0	0	1
Nevada	0	0	0	------	------	------	15	4	4	0	1	0
PACIFIC												
Washington	3	10	7	------	1	2	241	25	25	0	2	2
Oregon	9	2	2	269	22	22	34	54	55	7	6	6
California	30	34	17	436	26	108	414	210	210	21	22	13
Total	458	361	361	48,041	4,587	4,587	2,769	979	7,892	189	238	238

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended January 5, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945		Jan. 5, 1946	Jan. 6, 1945	
NEW ENGLAND												
Maine	0	3	0	35	35	14	0	0	0	0	0	0
New Hampshire	1	0	0	2	19	6	0	0	0	0	0	0
Vermont	1	0	0	4	5	8	0	0	0	0	0	0
Massachusetts	1	0	0	163	261	262	0	0	0	0	0	1
Rhode Island	0	0	0	12	19	13	0	0	0	0	0	0
Connecticut	0	1	0	31	49	49	0	0	0	1	1	1
MIDDLE ATLANTIC												
New York	6	9	2	263	408	367	0	0	0	4	1	2
New Jersey	1	1	0	56	120	120	0	0	0	1	1	0
Pennsylvania	0	0	0	146	250	250	0	0	0	3	3	5
EAST NORTH CENTRAL												
Ohio	3	5	1	216	317	290	0	0	0	2	1	3
Indiana	1	4	1	56	115	103	1	4	2	0	0	1
Illinois	0	0	0	139	269	219	0	1	0	3	2	2
Michigan [2]	0	0	0	39	35	72	0	0	0	0	0	0
Wisconsin	10	0	0	84	145	145	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	22	53	66	0	0	0	0	0	0
Iowa	0	0	1	39	55	53	0	0	0	0	0	1
Missouri	1	2	0	38	82	52	0	0	0	1	0	0
North Dakota	0	0	0	5	11	16	0	0	0	0	0	0
South Dakota	0	0	1	11	39	39	0	0	0	0	0	0
Nebraska	0	0	0	48	15	33	0	1	0	0	0	0
Kansas	0	0	0	80	125	80	0	0	0	0	2	0
SOUTH ATLANTIC												
Delaware	0	0	0	6	9	12	0	0	0	0	0	0
Maryland [2]	0	0	0	55	105	43	0	0	0	0	1	1
District of Columbia	0	0	0	5	42	15	0	0	0	3	1	0
Virginia	0	4	1	55	97	46	0	0	0	2	0	1
West Virginia	0	1	1	38	69	49	0	0	0	1	0	0
North Carolina	0	0	0	51	94	81	1	0	0	0	1	1
South Carolina	0	0	0	6	11	13	0	0	0	2	1	1
Georgia	1	1	0	12	32	23	0	0	0	0	0	3
Florida	0	1	1	6	13	8	0	0	0	0	0	0
EAST SOUTH CENTRAL												
Kentucky	0	1	1	40	38	48	0	1	0	0	0	1
Tennessee	2	0	0	49	59	49	0	0	0	5	1	1
Alabama	1	0	0	22	29	29	0	1	1	0	1	2
Mississippi [2]	3	3	0	15	21	13	0	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas	1	0	0	9	11	7	0	1	0	1	1	1
Louisiana	1	1	0	16	13	9	0	0	0	2	0	2
Oklahoma	1	1	1	46	55	18	1	1	0	0	0	1
Texas	5	2	2	87	131	54	0	0	1	7	4	5
MOUNTAIN												
Montana	0	1	1	13	9	26	0	0	0	0	0	0
Idaho	0	0	0	7	63	8	0	2	1	0	0	0
Wyoming	0	0	0	1	8	7	0	0	0	0	0	0
Colorado	0	1	0	29	113	30	0	0	1	0	2	1
New Mexico	0	2	0	13	17	6	0	0	0	0	4	3
Arizona	1	1	0	13	22	7	0	0	0	1	0	0
Utah [2]	1	0	0	32	43	43	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	3	0
PACIFIC												
Washington	4	3	2	45	75	52	0	0	0	1	0	0
Oregon	0	0	0	20	39	14	0	0	0	0	0	0
California	1	4	4	203	277	150	1	0	0	0	1	2
Total	47	52	34	2,383	3,922	3,457	4	12	12	40	32	58

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately as follows: Connecticut 1; New Jersey 1; South Carolina 2; Tennessee 3; Texas 1.

Telegraphic morbidity reports from State health officers for the week ended January 5, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Jan. 5, 1946	Whooping cough: Week ended— Jan. 6, 1945	Whooping cough: Median 1941–45	Week ended Jan. 5, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	19	37	37								
New Hampshire	5	1	1								
Vermont	16	50	33								
Massachusetts	129	74	247		2		1				1
Rhode Island	19	6	11								
Connecticut	31	73	73	1	1						
MIDDLE ATLANTIC											
New York	179	167	375	4	4					1	2
New Jersey	91	85	103			1					1
Pennsylvania	94	141	283				2				1
EAST NORTH CENTRAL											
Ohio	71	118	144						3		1
Indiana	12	13	19	3		2					
Illinois	47	72	145								2
Michigan [3]	18	17	97		2						
Wisconsin	48	73	98								4
WEST NORTH CENTRAL											
Minnesota	8	30	34	1							1
Iowa	6	2	11								3
Missouri	7	13	17						3		
North Dakota		1	6								
South Dakota		8	8								
Nebraska	5	2	8								
Kansas	17	31	46								1
SOUTH ATLANTIC											
Delaware		8	8								
Maryland [3]	20	72	59			3			3		
District of Columbia	10	3	13								
Virginia	44	45	61			21			6	1	
West Virginia	3	18	28								
North Carolina	26	71	115							2	
South Carolina	63	78	55		69					2	
Georgia	6	6	18	2	1				2	11	5
Florida	1	4	15							4	
EAST SOUTH CENTRAL											
Kentucky	5	13	22				1				
Tennessee	11	12	20						3	1	
Alabama	4	17	17	1						7	9
Mississippi [3]										3	1
WEST SOUTH CENTRAL											
Arkansas	3	22	10							1	
Louisiana	2	2	2	2						3	
Oklahoma	5	5	5								
Texas	107	200	200	18	368	29				30	9
MOUNTAIN											
Montana	6	15	15								
Idaho	7		2								
Wyoming		8	8								
Colorado	23	34	23								
New Mexico	2		9	1							
Arizona	10	5	21			45					1
Utah [3]	12	8	20								1
Nevada	1		3								
PACIFIC											
Washington	69	21	43								1
Oregon	13	15	13								
California	98	149	154	4	3		1			1	3
Total	1,373	1,845	3,449	37	450	101	5	0	20	67	47
Same week, 1945	1,845			9	954	314	5	0	39	85	55
Average, 1943-45	2,344			15	461	131	6	[4] 0	33	[4] 66	34

[3] Period ended earlier than Saturday.
[4] 5-year median 1941-45.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 29, 1945

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	1	0	------	0	4	1	5	0	1	1
New Hampshire:												
Concord	0	0	------	0	------	0	3	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	1	0	0	------
Massachusetts:												
Boston	3	1	------	1	13	2	16	0	34	0	0	18
Fall River	0	0	------	0	------	0	4	0	1	0	0	5
Springfield	0	0	------	0	1	1	2	0	5	0	0	11
Worcester	0	0	------	0	8	0	11	0	7	0	0	13
Rhode Island:												
Providence	1	0	1	1	------	0	4	0	2	0	0	15
Connecticut:												
Bridgeport	0	0	4	0	1	0	5	0	2	0	0	1
Hartford	0	0	------	0	1	0	0	0	6	0	0	1
New Haven	0	0	------	0	------	0	2	0	0	0	0	5
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	3	2	10	1	8	0	3	0	0	19
New York	6	1	71	8	38	7	154	0	82	0	1	47
Rochester	0	0	------	0	1	0	5	0	5	0	1	1
Syracuse	0	0	------	0	193	1	4	0	12	0	0	5
New Jersey:												
Camden	0	0	1	2	1	0	7	0	1	0	0	1
Newark	0	0	28	4	4	2	7	0	11	0	0	17
Trenton	0	0	3	1	------	0	1	0	2	0	0	------
Pennsylvania:												
Philadelphia	2	0	21	5	109	1	28	0	34	0	2	26
Pittsburgh	1	0	7	8	------	5	23	0	14	0	0	3
Reading	0	0	1	1	2	0	3	0	1	0	0	14
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	7	1	2	24	0	18	0	0	6
Cleveland	1	0	22	4	2	3	18	0	17	0	0	7
Columbus	4	0	1	1	------	0	3	1	6	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	------	0	8	0	0		0	------
Indianapolis	2	0	------	2	3	0	12	0	1	0	0	2
South Bend	0	0	------	0	2	0	0	0	1	0	0	------
Terre Haute	0	0	------	1	------	0	8	0	0	0	0	------
Illinois:												
Chicago	3	0	16	4	294	5	59	1	49	0	0	37
Springfield	1	0	------	0	------	0	5	0	1	0	0	------
Michigan:												
Detroit	3	0	10	4	80	2	30	0	34	0	0	39
Flint	5	0	------	0	44	0	0	0	7	0	0	------
Grand Rapids	0	0	------	0	1	0	2	0	3	0	0	1
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	1	0	0	------
Milwaukee	0	0	------	0	4	0	0	0	17	0	0	9
Racine	0	0	------	0	------	0	0	0	1	0	0	------
Superior	0	0	------	0	------	0	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	1	------	0	2	0	3	0	0	------
Minneapolis	3	0	------	0	1	0	3	0	13	0	0	------
Missouri:												
Kansas City	2	0	8	5	35	0	12	0	10	0	0	------
St. Joseph	0	0	------	0	11	0	0	0	0	0	0	------
St. Louis	3	1	42	6	8	1	24	1	13	0	0	3

City reports for week ended December 29, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	2	0	------	1	1	0	10	0	3	0	0	------
Kansas:												
Topeka	1	0	------	0	5	0	0	0	0	0	0	------
Wichita	0	0	2	0	1	0	5	0	7	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	----	0	2	0	7	0	0	0	0	1
Maryland:												
Baltimore	10	0	64	4	4	0	26	0	6	0	0	5
Cumberland	0	0	-----	0	-------	0	1	0	0	0	0	------
Frederick	0	0	------	0	-------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	1	44	1	-------	3	18	0	9	0	2	15
Virginia:												
Lynchburg	0	0	-----	0	-------	0	1	0	4	0	0	4
Richmond	0	0	2	2	-------	0	9	0	7	0	0	------
Roanoke	0	0	------	0	-------	0	0	0	1	0	0	------
West Virginia:												
Wheeling	0	0	------	2	-------	0	3	0	1	0	0	------
North Carolina:												
Raleigh	0	0	------	0	-------	0	3	0	2	0	0	3
Wilmington	0	0	------	0	-------	0	2	0	5	0	0	2
Winston-Salem	0	0	----	0	-------	0	1	0	3	0	0	2
South Carolina:												
Charleston	1	0	368	0	-------	0	1	1	1	0	0	------
Georgia:												
Atlanta	1	0	77	5	2	1	13	0	0	0	0	------
Brunswick	0	0	------	0	-------	1	0	0	0	0	0	------
Savannah	0	0	14	0	-------	0	0	0	3	0	0	------
Florida:												
Tampa	1	0	1	0	12	1	4	0	1	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	28	3	7	1	16	0	3	0	1	1
Nashville	1	0	------	1	2	1	6	0	1	0	0	------
Alabama:												
Birmingham	2	0	50	1	-------	1	8	0	3	0	0	------
Mobile	2	0	15	3	1	0	1	0	1	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	13	1	2	0	2	0	0	0	0	------
Louisiana:												
New Orleans	2	0	4	2	1	1	8	0	7	0	1	------
Shreveport	2	0	------	3	-------	0	8	0	2	0	0	------
Texas:												
Dallas	4	0	4	1	-------	0	7	0	3	0	1	------
Galveston	0	0	------	0	-------	0	0	0	1	0	0	------
Houston	2	0	------	0	-------	7	6	0	3	0	2	------
San Antonio	5	0	8	1	1	0	16	0	2	0	0	2
MOUNTAIN												
Montana:												
Billings	0	0	------	0	-------	0	2	0	1	0	0	------
Great Falls	0	0	------	1	-------	0	1	0	1	0	0	------
Helena	0	0	------	0	-------	0	0	0	0	0	0	------
Missoula	0	0	104	0	-------	0	1	0	1	0	0	------
Idaho:												
Boise	0	0	------	0	-------	0	3	0	0	0	0	------
Colorado:												
Denver	2	0	28	2	1	0	7	0	15	0	0	8
Pueblo	0	0	------	0	1	0	2	0	2	0	0	------
Utah:												
Salt Lake City	0	0	------	0	3	0	3	1	2	0	0	1

City reports for week ended December 29, 1945—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	0	0	------	0	43	0	6	2	4	0	0	6
Spokane	0	0	1	0	12	0	2	0	0	0	0	3
Tacoma	0	0	5	0	21	0	1	0	0	0	0	2
California:												
Los Angeles	3	0	128	6	8	6	7	1	37	0	0	4
Sacramento	0	0	1	1	2	0	1	0	0	0	0	4
San Francisco	2	0	2	1	41	1	15	1	3	0	0	------
Total	86	4	1,203	110	1,041	57	734	10	568	0	12	372
Corresponding week, 1944	57	------	101	39	301	------	476	------	1,081	0	5	391
Average, 1940–44	73	------	2,756	[1] 134	[2] 1,728	------	[1] 706	------	996	2	12	814

[1] 3-year average, 1942–44.
[2] 5-year median, 1940–44.
Dysentery, amebic.—Cases: Buffalo 2; New York 4.
Dysentery, bacillary.—Cases: New York 2; St. Louis 1; Charleston, S. C. 1.
Dysentery, unspecified.—Cases: San Antonio 11.
Tularemia.—Cases: Baltimore 1; Nashville 2.
Typhus fever, endemic.—Cases: Charleston, S. C. 1; Atlanta 1; Nashville 1; Mobile 4; New Orleans 1; Houston 3; Los Angeles 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,010,100)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	10.5	2.6	15.7	5.2	63	7.8	133.3	2.6	165	0.0	2.6	183
Middle Atlantic	4.6	0.5	62.5	14.3	166	7.9	111.1	0.0	76	0.0	1.9	62
East North Central	12.8	0.0	29.8	14.0	202	7.3	102.8	1.2	95	0.0	0.0	62
West North Central	24.8	2.3	117.2	29.3	140	2.3	126.2	2.3	110	0.0	0.0	9
South Atlantic	21.8	1.7	954.5	23.4	33	10.0	149.0	1.7	72	0.0	3.3	54
East South Central	29.5	0.0	548.9	47.2	59	17.7	183.0	0.0	47	0.0	5.9	6
West South Central	43.0	0.0	83.2	23.0	11	23.0	134.9	0.0	52	0.0	11.5	6
Mountain	15.9	0.0	1,048.4	23.8	40	0.0	150.9	7.9	175	0.0	0.0	71
Pacific	7.9	0.0	216.7	12.7	201	11.1	50.6	6.3	70	0.0	0.0	30
Total	13.2	0.6	184.9	16.9	100	8.8	112.8	1.5	87	0.0	1.8	57

TERRITORIES AND POSSESSIONS

Panama Canal Zone

Notifiable diseases—October 1945.—During the month of October 1945, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	6		1						7	
Diphtheria	13	2	2		1		2		18	2
Dysentery:										
Amebic	2				1		3		6	
Bacillary	1				3				4	
Malaria [1]	5		6		36		76	3	123	3
Meningitis, meningococcus	1								1	
Mumps							1		1	
Paratyphoid fever				1						1
Pneumonia		7		1	39	1		5	[2] 39	14
Poliomyelitis			1		2	1	2		5	1
Scarlet fever	1				1		1		3	
Tuberculosis		16		7	1	4		6	[2] 1	33
Typhoid fever	1						2		3	
Typhus fever	1						1		2	
Whooping cough					1				[2] 1	

[1] 21 recurrent cases.
[2] Reported in the Canal Zone only

FOREIGN REPORTS

ANGOLA

Notifiable diseases—July–September 1945.—During the months of July, August, and September 1945, certain notifiable diseases were reported in Angola as follows:

Disease	July		August		September	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Beriberi	11		12	2	9	
Bilharziasis	297		207	1	268	
Cerebrospinal meningitis	80	7	149	7	167	10
Chickenpox	66		6		171	
Diphtheria	2	1	2			
Erysipelas			2			
Dysentery:						
Amebic	132	3	98	5	154	1
Bacillary	11	3	11	1	2	
Gonorrhea	213		259		254	1
Hookworm disease	552	10	724	6	760	6
Influenza	792	12	1,489	18	1,006	7
Leprosy	15		15		14	
Measles	209	1	354	1	375	1
Mumps	14		44			
Pneumonia (all forms)	345	30	433	41	351	36
Poliomyelitis					5	
Relapsing fever	50		34		25	
Scarlet fever			2			
Septicemia	7	6	3	1	3	2
Smallpox	6		118		16	
Syphilis	413	1	459	2	459	1
Tetanus	6	5	5	3	5	2
Trachoma	1				24	
Tuberculosis (respiratory)	60	6	53	10	66	11
Trypanosomiasis	133	16	264	9	220	22
Typhoid and paratyphoid fever	2		4	1	10	1
Yaws	1,039		1,196	1	1,077	
Whooping cough	46		42	1	60	

CANADA

Provinces—Communicable diseases—Week ended December 8, 1945.—During the week ended December 8, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		7		222	381	74	88	76	185	1,033
Diphtheria		3	7	57	12	8			2	89
Dysentery, bacillary				3						3
German measles				11	22		2	6	12	53
Influenza		2			43				2	47
Measles		3		102	415	4	21	19	65	689
Meningitis, meningococcus					2			1		3
Mumps			4	112	80	13	12	142	77	440
Poliomyelitis		1			1		2			4
Scarlet fever	1	15	34	86	91	17	5	19	28	296
Tuberculosis (all forms)		1	9	91[a]	83	20	13	20	66	303
Typhoid and paratyphoid fever				21	2					23
Undulant fever					2				1	3
Venereal diseases:										
Gonorrhea		25	18	58	143	59	43	51	81	478
Syphilis		31	8	101	120	28	16	19	34	357
Whooping cough		15	19	125	42	17	1	3		222

NORWAY

Notifiable diseases—June–August 1945.—During the months of June, July, and August 1945, cases of certain notifiable diseases were reported in Norway as follows:

Disease	June	July	August
Cerebrospinal meningitis	10	24	10
Diphtheria	486	573	533
Dysentery, unspecified	141	57	190
Encephalitis, epidemic	1	4	6
Erysipelas	429	402	446
Gastroenteritis	5,613	6,671	10,436
Gonorrhea	417	472	641
Hepatitis, epidemic	1,002	629	780
Impetigo contagiosa	3,179	3,378	4,947
Influenza	1,296	761	1,020
Laryngitis	9,256	5,709	5,580
Lymphogranuloma inguinale		1	1
Malaria		1	
Measles	6,035	4,088	2,953
Mumps	113	60	95
Paratyphoid fever	3	12	22
Pneumonia (all forms)	1,619	901	751
Poliomyelitis	19	59	142
Rheumatism	185	166	153
Scabies	3,998	3,580	4,556
Scarlet fever	410	336	318
Syphilis	87	87	97
Tuberculosis (all forms)	401	368	360
Typhoid fever	8	5	3
Weil's disease	1	3	3
Whooping cough	1,421	1,600	2,434

Population, estimated, 1940—2,937,000.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; P, present]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January—October 1945	November 1945	December 1945—week ended—				
				1	8	15	22	29
ASIA								
Ceylon: Trincomalee District	C	16		1			2	
China:[1]								
Hupeh Province	C	60						
Kwangsi Province	C	12						
Kwangtung Province	C	105						
Kweichow Province	C	640						
Shensi Province	C	10						
Sikong Province	C	9						
Szechwan Province	C	13,360						
Chungking	C	8,000						
Yunnan Province	C	23						
India	C	214,144						
Bombay	C	98						
Calcutta	C	5,120	71					
Cawnpore	C	202	3					
Chittagong	C	19						
Delhi	C	318						
Madras	C	52						
Vizagapatam	C	31						
Indochina: Cochinchina	C	P	P					

[1] Cholera was also reported present during August in the following Provinces of China: Chekiang, Honan, Hunan, and Kansu.

PLAGUE

[C indicates cases; D, deaths]

Place		January—October 1945	November 1945	December 1945—week ended—				
				1	8	15	22	29
AFRICA								
Algeria	C	[1] 13			1			
Basutoland	C	4						
Bechuanaland	C	7						
Belgian Congo	C	[2] 24	4					
British East Africa:								
Kenya	C	[3] 88	5					
Uganda	C	6						
Egypt	C	220	1		1		1	
Ismailiya	C	83						
Port Said	C	83			1			
Suez	C	23					1	
French West Africa	C	5						
Dakar	C	1						
Madagascar	C	134	15					
Morocco (French)	C	811						
Senegal	C	54						
Tunisia	C	3						
Union of South Africa	C	8	3					
ASIA								
China:								
Foochow	C	30						
Kwangtung Province	C	17						
Kiangsi Province	C	1						
Yunnan Province [4]	C	38						
India	C	22,917						
Iraq	C	34						
Palestine	C	26	17	3	3			
Plague-infected rats		42						
EUROPE								
France: Corsica—Ajaccio	C	8						
Great Britain: Malta	C	[1] 62	10		1			
Italy	C	25	2			1		
Portugal: Azores	C	50	3					
Spain: Canary Islands	C	1						
NORTH AMERICA								
Canada: Alberta Province: [5]								
Plague-infected squirrels		2						
SOUTH AMERICA								
Argentina:								
Buenos Aires Province—Plague-infected rats		2						
Santiago del Estero Province	C	2						
Tucuman Province	C	1						
Bolivia: Santa Cruz Department	C	[6] 79						
Brazil:								
Ceara State	C	5						
Pernambuco State	C	51						
Ecuador:								
Canar Province	C	9						
Chimborazo Province	C	6						
Loja Province	C	20						
Peru:								
Ancash Department	C	7						
Ica Department	C	[7] 4						
Lambayeque Department	C	13						
Libertad Department	C	11						
Lima Department	C	15						
Otuzco Department	C	3						
Piura Department	C	5						
Tumbes Province	C		19					

[1] Includes 4 suspected cases.
[2] Includes 7 suspected cases.
[3] Includes 5 suspected cases.
[4] Information dated July 5, 1945, stated that from April 1944 to May 1945, 85 deaths from plague had occurred in the mountainous region south of Kunming, China.
[5] During the month of June 1945, plague infection in fleas was reported in Alberta Province. For the week ended July 28, 1945, plague infection was also reported in 6 pools of fleas in Alberta Province. For the week ended Aug. 11, 1945, 2 pools of plague-infected fleas were reported in Alberta Province, Canada.
[6] Includes 6 suspected cases.
[7] Includes 1 suspected case.

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January—October 1945	November 1945	December 1945—week ended— 1	8	15	22	29
OCEANIA								
Hawaii Territory	D	[8] 1						
Plague-infected rats [9]		13						
New Caledonia: Loyalty Islands—Mare Island	C	[10] 60						

[8] Previously reported as a case, death occurring on June 2, 1945.
[9] Plague infection was also proved positive in a pool of 5 mice on Jan. 4, in a pool of fleas on Feb. 14, and in a pool of 40 fleas on Mar. 14, 1945.
[10] Pneumonic plague.

SMALLPOX

[C indicates cases; P, present]

Place		January—October 1945	November 1945	December 1945—week ended— 1	8	15	22	29
AFRICA								
Algeria	C	209						
Angola	C	224						
Basutoland	C	352	8					
Belgian Congo	C	[1] 6,456	[1] 219	30	22			
British East Africa:								
Kenya	C	643	96	8	16			
Nyasaland	C	120	38		8			
Tanganyika	C	5,627	97					
Uganda	C	1,043	29					
Cameroon (French)	C	817	10					
Dahomey	C	264	28					
Egypt	C	1,070	5	1				
French Equatorial Africa	C	1,606	91					
French Guinea	C	1,592	62					
French West Africa: Dakar District	C	401						
Gambia	C	82						
Gold Coast	C	677	46	35	31		44	
Ivory Coast	C	529	20					
Libya	C	8	10	5				
Mauritania	C	83						
Morocco (French)	C	1,776	466				[2] 277	
Mozambique	C	1						
Nigeria	C	4,205						
Niger Territory	C	529	69					
Rhodesia:								
Northern	C	4,735	534					
Southern	C	10						
Senegal	C	498						
Sierra Leone	C	84	21	1				
Somaliland, British	C	1						
Sudan (Anglo-Egyptian)	C	[3] 3						
Sudan (French)	C	2,210	322					
Togo (British)	C	36	18					
Togo (French)	C	507	18					
Tunisia	C	15	125					
Union of South Africa [4]	C	1,947	P	P				
ASIA								
Arabia	C	29						
Ceylon	C	[5] 661	67	20		6	5	112
China	C	1,272						
India	C	225,835						
Iran	C	400						
Iraq	C	41						
Syria and Lebanon	C	12	1			1		
Trans-Jordan	C	2						
Turkey (see Turkey in Europe).								
EUROPE								
Belgium	C	1						
France	C	27						
Germany	C	2						
Great Britain: Scotland	C	[3] 2						
Italy	C	2,186						
Sicily	C	9						
Portugal	C	28						
Spain	C	31						
Canary Islands	C	1						
Turkey	C	295			2			

[1] Includes cases of alastrim.
[2] for the period Dec. 1–20, 1945.
[3] Imported.
[4] For the week ended June 30, 1945, cases of virulent smallpox were reported in the Union of South Africa.
[5] Includes some cases of chickenpox.

SMALLPOX—Continued

[C indicates cases; P, present]

Place		January—October 1945	November 1945	December 1945—week ended—				
				1	8	15	22	29
NORTH AMERICA								
Canada	C	6						
Guatemala	C	4						
Honduras	C	8						
Mexico	C	1,426						
Nicaragua	C	[1] 141						
SOUTH AMERICA								
Argentina	C	6						
Bolivia	C	1,495	151					
Brazil	C	[1] 726						
Colombia	C	1,006						
Ecuador	C	39						
Paraguay	C	1						
Peru	C	160						
Uruguay	C	81						
Venezuela	C	[1] 843	[1] 73	[1] 32				

[1] Includes cases of alastrim.

TYPHUS FEVER*

[C indicates cases; P, present]

Place		January—October 1945	November 1945	December 1945—week ended—				
				1	8	15	22	29
AFRICA								
Algeria	C	1,024						
Basutoland	C	118						
Belgian Congo [1]	C	302	337	107	38			
British East Africa: Kenya	C	39						
Egypt	C	15,476	16	39				
Eritrea	C	39	8	6			5	
French West Africa: Dakar [1]	C	20						
Gold Coast	C	1						
Libya: Tripolitania	C	21	2					
Madagascar	C	1						
Morocco (French)	C	7,565	250				[2] 167	
Morocco (Spanish)	C	7	1					
Nigeria	C	89						
Rhodesia, Northern	C	31						
Sierra Leone [1]	C	8	3					
Tunisia	C	885	5					
Union of South Africa	C	776	P	P				
ASIA								
China	C	1,874						
India	C	23						
Iran	C	826						
Iraq [1]	C	248	18	5	2			
Palestine [1]	C	166						
Syria and Lebanon	C	12				2		
Trans-Jordan	C	45	1		1			
Turkey (see Turkey in Europe).								
EUROPE								
Albania	C	100						
Austria	C	46	5					
Belgium	C	158						
Bulgaria	C	934	33	3				
Czechoslovakia	C	398	130					
Denmark	C	146						
France	C	267	36					
Germany	C	7,903	43	3	6			
Gibraltar [1]	C	6	3					
Great Britain	C	[3] 21	4					
Malta and Gozo [1]	C	15						
Greece	C	601				29		
Hungary.[4]								
Italy	C	192				1		
Netherlands	C	54	12					
Poland	C	13,740	71					
Portugal	C	51	1					
Rumania	C	[5] 7,831	413					
Spain	C	28			1			
Sweden	C	226						
Switzerland	C	6						
Turkey	C	2,511	87	38	36	38	35	50
Yugoslavia	C	2,285						

See footnotes at end of table.

TYPHUS FEVER—Continued

[C indicates cases; P present]

Place		January—October 1945	November 1945	December 1945—week ended— 1	8	15	22	29
NORTH AMERICA								
Canada [1]	C	1						
Costa Rica [1]	C	7	5					
Cuba [1]	C	13						
Guatemala	C	2,343						
Jamaica [1]	C	43						
Martinique [1]	C	1						
Mexico	C	1,542						
Panama (Republic)	C	4						
Puerto Rico [1]	C	172	5	3				
Virgin Islands [1]	C	8						
SOUTH AMERICA								
Argentina	C	9						
Bolivia	C	641	76					
Brazil	C	5						
Chile [1]	C	544						
Colombia	C	422						
Curacao	C	3						
Ecuador	C	516						
Peru	C	558						
Venezuela [1]	C	130	6					
OCEANIA								
Australia [1]	C	108	8					
Hawaii Territory [1]	C	85	5					

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Reports cases as murine type. [2] For the period Dec. 1–20, 1945. [3] Includes imported cases.

[4] For the period Jan. 1 to Sept. 1, 1945, between 8,000 and 10,000 cases of typhus fever were reported in Hungary.

[5] For the period Jan. 1–20, 1945.

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA								
Gold Coast	C	[1] 13						
Nsawam	C	[2] 3						
Takoradi	C	1						
Tamale	C	[3] 1						
Winneba	C	[4] 4						
Ivory Coast:								
Gaoua	C	1						
Guiglo	C	1						
Sierra Leone: Moyamba	C	2						
Sudan (French): Bamako	C	[3] 1						
SOUTH AMERICA								
Bolivia:								
Beni Department	C	1						
La Paz Department	C	2						
Brazil:								
Goiaz State	D	76						
Minas Geraes State	D	25						
Para State	D	1						
British Guiana: Kwakwani	C	1						
Colombia:								
Magdalena Department	D	3						
Santander de Norte Department	D	19						
Peru:								
Cuzco Department	C	3						
Junin Department	C	8						
Loreto Department	C	1						
Venezuela:								
Bolivar State	C	1						
Merida State	C	3						
Tachira State	D	20						
Zulia State	C	8						

[1] Includes 4 suspected cases. [2] Includes 2 suspected cases. [3] Suspected. [4] Includes 1 suspected case.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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Public Health Reports

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THE PREPARATION OF SLIDES FOR MEASUREMENT OF DUST PARTICLE SIZE[1]

By W. E. McCormick,[2] *Passed Assistant Chemist (R), United States Public Health Service*

The determination of the particle size of atmospheric dusts of unhygienic significance is frequently necessary in order to evaluate properly the health hazard arising from a given dusty operation or process. The prevailing method now in use for making this determination is to measure microscopically (by either a filar micrometer or a microprojector) a sufficient number of particles (usually 150 to 200) of the atmospheric dust, and then to determine graphically the geometric mean size and standard deviation (*1, 2, 3*).

At least three methods have been used frequently by industrial hygienists for obtaining the dust specimen for measurement. These are:

1. Deposition of the dust directly from the workroom atmosphere onto a microscope cover slip by the Owens jet dust counter (*1, 4*).
2. Evaporation of a drop of the impinger dust sample solution on a microscope slide (*1, 4*).
3. Preparation of a microscope slide by Green's method from a small portion of dry dust mixed with a vehicle such as turpentine (*5*).

For some dusts all of these methods are unsatisfactory and are open to criticism.

Bloomfield (*4*) and Bloomfield and Dalla Valle (*1*) found agreement existing between the first two methods, but favored the use of the first because of the greater simplicity both of collection of the dust and of final preparation of the specimens. The dusts used by them, however, for comparative purposes, were of the nonfibrous types, and possessed, for each individual sample, fairly uniform particle sizes. With dusts of the fibrous types, such as that found in asbestos textile

[1] From the Industrial Hygiene Division.

[2] On detail to the Division of Industrial Hygiene, North Carolina State Board of Health, Raleigh, N. C.

manufacturing plants, where both the fiber size and content may be of industrial health significance, it is questionable whether the Owens instrument obtains samples which are representative of the workroom atmosphere. The instrument has been used for studies of this type (*6*), but more data appear to be needed to determine its reliability with this type of dust. It is known that the instrument is selective for particles below 2 microns (*1*, p. 36). In a few preliminary comparative tests recently made by the author on slides prepared from asbestos dust both by the Owens dust counter and by the evaporation method, it has been observed that a considerably lower percentage of fibers existed on the Owens slides. The exact explanation for this is not known, although it might be due to the greater difficulty in wetting the larger asbestos fibers by the method used in this instrument (by moisture condensation on the dust due to the high velocity and the resulting cooling of the moisture-saturated air in passing through the slit), and thus decreasing their ability to adhere to the glass cover slip.

Slides prepared by the second method are not wholly satisfactory, when dealing with fibrous dusts, due to the tendency to agglomeration of the particles and fibers. This frequently renders the particles on the slide very difficult or impossible to measure.

Green's method utilizes dry dust collected either by the filter bag method of Hatch (*7*), or from rafters and ledges in the workroom atmosphere. Silverman and Franklin (*8*), however, have shown that this method of slide preparation tends to disintegrate the more fragile particles, and is not satisfactory for particle size measurements of industrial dust.

The author has used for some time a method of slide preparation which overcomes the above objections. Although no advantage for it is claimed over the first two methods for dusts of either the nonfibrous or nonagglomerating types, it is equally applicable to them. In brief, the method involves the settling of the suspended dust (from a liquid medium) onto the surface of a No. 1 microscope slide cover glass, allowing the suspending liquid to evaporate slowly to dryness, and then mounting the cover glass, dust side down, onto a microscope slide for later examination and measurement. The dust deposit, thus being on the underside of the cover glass, can be sharply focused and measured by oil immersion.

Either the Dunn dust-counting cell (*9*) or the modification of this cell recently described (*10*) is used as the settling chamber. The No. 1 cover glass (1-inch circle or square) is used as the base. The cell is filled with a small portion of the impinger sample, and covered with a 1- by 3-inch microscope slide. Evaporation of the liquid is allowed to proceed spontaneously. It has been found that just barely "cracking" the cell, by sliding the edge of the microscope

FIGURE 1.—Photomicrographs of asbestos dust made at 500× from slides for which the settling technique of dust deposition was used.

slide to the edge of the cell hole, will aid in the evaporation without permitting entrance of extraneous atmospheric dust. A practical means of accomplishing the settling and evaporation is to permit it to proceed overnight. The dust is thus evenly dispersed over a circular area of about 22 mm. in diameter on the floor of the cell (the No. 1 cover glass).

Upon complete evaporation of the liquid, the glass spacer of the cell is carefully removed and the downturned surface of the microscope slide placed on the upturned surface of the cover glass, so that the area of the slide which covered the cell hole is superimposed over the dust deposit. In this way extraneous contamination is avoided. The slide and cover both can then be inverted as a unit, and the cover firmly cemented to the slide with any of the common microscopic mounting materials for future examination and measurement. If it is desired to mount the dust specimen in a suitable liquid medium for either particle size or refractive index measurements, the cover glass can be cemented at only a few spots, and the medium can than be carefully flowed in between the cover and slide while in the mounted position.

It is very important in preparing the slides, in order to obtain even distribution of the dust without agglomeration, that all parts be clean. The following sequence of cleaning operations has been found to be satisfactory: Scrubbing with soap and water, rinsing with water, immersing in dichromate-sulfuric acid cleaning solution for 10 to 15 minutes, rinsing several times with tap water, and finally rinsing with 95 percent alcohol. The glass parts should be handled only with forceps after immersion in the cleaning solution, inasmuch as the perspiration and the oils from the skin will cause grease contamination and will interfere with uniform distribution of the dust particles.

Figure 1 shows photographs (500X) made of asbestos dust, collected by an impinger, with the slides made by the above method. The photographs illustrate the uniformity of distribution and discreteness of the particles and fibers.

Ethyl alcohol (95 percent) has been used as the collecting medium and the impinger as the method of collection in all of the slide preparations made by the author by this method. However, the method is equally applicable to samples collected by the electrostatic precipitator, or to dry dust samples, suspended in a suitable liquid.

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COMPOSITION OF SOME TRADE NAME SOLVENTS USED FOR CLEANING AND DEGREASING, AND FOR THINNING PAINTS [1]

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As a result of a series of acute cases of systemic poisoning, with one fatality, among workers using solvents at a shell- and bomb-loading plant, it was decided to make available to the explosives plants [2] useful information on the composition and relative toxicity of many of the trade name solvent products used in these establishments. By means of questionnaires to approximately 90 Government-owned explosives manufacturing, loading, and storing plants a roster was obtained of all solvents in current use. From this list approximately 200 representative products were selected for chemical analysis. Samples of the selected products were sent by the respective establishments to the Army Industrial Hygiene Laboratory or to the Industrial Hygiene Division of the United States Public Health Service for chemical analysis.[3] The results of these analyses were then compiled into a solvent index which contained all the pertinent data in a form which would permit their convenient use by the personnel of the plant, medical, safety, and engineering departments.

Since many of the products investigated are used also by many other industries it was deemed advisable to make the information available generally to everyone interested in industrial hygiene. It must be remembered, however, that the composition of the various products, as given in tables 1, 2, and 3, is the composition of the

[1] From the Industrial Hygiene Branch, Safety and Security Division, Ordnance Department, Army Service Forces.

[2] Plants assigned to the Safety and Security Division, Office of the Chief of Ordnance for production security inspection.

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specific sample analyzed and may represent accurately only one lot of the product. Manufacturers of materials of this type frequently change the ingredients or the proportions thereof for various reasons. Consequently, there is no assurance that these products would be exactly the same if purchased today as they were during the second quarter of the present calendar year (1945) when the analyses were made. The only way to be certain of the composition of products of this nature is to analyze a sample from each lot number as received. On the other hand, the general make-up of many of the products listed in tables 1, 2, and 3 will remain remarkably similar since the ingredients are selected by the manufacturers primarily on a functional basis.

The substances analyzed have been classified alphabetically under the names submitted by the users in tables 1, 2, and 3. The names of the suppliers or manufacturers are also given. The supplier or manufacturer listed is the one given by the plant using the particular substance and many of the products listed are available from other sources. The first column contains an index number which serves to identify the material for convenient reference in table 4.

It should be emphasized that the supplier or manufacturer listed in the tables is the one given by the plant which submitted the sample. Most of these same products can be obtained from a large variety of other suppliers. To obtain a fairly complete list of the suppliers would have required a prohibitive amount of time. Consequently, only the one from which the material was actually purchased is listed, with the thought that other plants which desire to use any of these products can obtain the names of the nearby dealers by writing to the one listed in the table.

The samples analyzed were divided into three groups according to their composition and use. In table 1 are listed the substances which are used as cleaners and degreasers, and which are composed mainly of organic solvents. In table 2 are listed the substances which are used as thinners for paints, lacquers, and other finishing materials. The ingredients of these also are largely organic solvents. The miscellaneous materials which are used chiefly as cleaners, degreasers, and protective coatings, and which contain relatively little organic liquid are listed in table 3. Table 4 is a reference table which contains a list of the various substances used by different plants according to mode of use or type of operation at which employed.

The organic liquid components of the products listed in the first three tables are divided into four all-inclusive groups chemically, which are physiologically more or less distinct. They are as follows:

1. Aromatics: These materials are very toxic. The common ones have maximum allowable concentrations of 50 to 200 p. p. m. Examples are benzene, toluene, and xylene.

2. Halogenated hydrocarbons: These chemicals also are very toxic. Most of those encountered in the group of samples analyzed have maximum allowable

TABLE 1.—*Organic solvents used for cleaning or degreasing operations*

Code No.	Name or trade name of product	Composition (percent): Aromatics (mac. 50–200 p. p. m.)	Halogenated hydrocarbons (mac. 50–200 p. p. m.)	Alcohols, esters, ethers, and ketones (mac. 200–400 p. p. m.)	Paraffins and naphthenes (mac. 500–1,000 p. p. m.)	Other	Boiling range (° C.)	Supplier or manufacturer
C–1	Actusol (grease solvent)				100		155–205	Warren Refining Co., Cleveland, Ohio.
C–2	Amercoat #10	29		58	13		110–158	Gregg Co., Philadelphia, Pa.
C–3	Amercoat #12	27		64	9		58–164	Do.
C–4	APCO-140				100		180–220	Bertram Naphtha Co., Kansas City, Mo.
C–5	Ber-to-sol	5	60		35		84–144	Do.
C–6	Blankrola	9	45		46		128–175	Addressograph-Multigraph Corp., Cleveland Ohio.
C–7	Oasite Sludge Solvent	45			55		170–260	Graff Motor Co., Rapid City, S. D.
C–8	CC Sol	10		17	73		80–146	Bertram Naphtha Co., Kansas City, Mo.
C–9	Cellosolve Acetate			100			155–158	Carbide & Carbon Chemicals Corp., Detroit, Mich.
C–10	Cleaners Naphtha				100		155–220	
C–11	Cleaning Fluid				100		145–200	Quartermaster, Aberdeen Proving Ground, Aberdeen, Md.
C–12	Colonel Speedy Carbon and Rust Remover.			45		Water	70–100	Jersey City Quartermaster Depot, Jersey City, N. J.
C–13	Dearboline Cleaning Compound				100		185–300	Dearborn Chemical Co., Philadelphia, Pa.
C–14	Degreasal		100				70–110	General Electric Supply Co., Denver, Colo.
C–15	Degreasal Hi T				100		160–222	General Electric Supply Co., Evansville, Ind.
C–16	Ditto Fluid			100			78 app.	Ditto Inc., Chicago, Ill.
C–17	Dry Cleaners Solvent				100		156–196	
C–18	Dry Cleaning Fluid		25		75		75–140	Shell Oil Co., Baltimore, Md.
C–19	Dry Cleaning Solvent				100		160–205	Paris Oil Co., Paris, Tex.
C–20	Dry Cleaning Solvent (PS 661A)				100		145–210	Standard Oil Co. (Ohio), Cleveland, Ohio.
C–21	Finger Print Remover				100			
C–22	Gas-O-Clenz				100		80–150	Gulf Oil Corp., Augusta, Ga.
C–23	Hylite				100		55–175	Socony Vacuum Oil Co., New York, N. Y.
C–24	Imperial Washer Cleaner	20	70		10		75–120	Martindale Electric Co., Cleveland, Ohio.
C–25	Ink Cleaner #77			80	20		75–235	Superior Type Co., Chicago, Ill.
C–26	Keelite Z. C. Stripper	25		65	10		60–135	Keelite Products Inc., Houston, Tex.
C–27	Kerosene				100			
C–28	Kleen-O-Type	35	65				75–80	Gulf States Sales Co., Birmingham, Ala.
C–29	Lacquer Thinner #CT–350	16		47	37		78–134	E. I. duPont, Wilmington, Del.
C–30	Lithotine				100		150–210	Sinclair and Valentine, Baltimore, Md.

C-31	Loosite	30		8	62		60-270	Petroleum Solvents Corp,. New York, N. Y.
C-32	Magnolia Sovalsol				100		160-200	Magnolia Petroleum Co., Amarillo, Tex.
C-33	Magnus Carbon Remover		55			Cresylic acid		
C-34	Magnusol				100		130-190	Magnus Chemical Co., Garwood, N. J.
C-35	Mineral Spirits				100		150-200	Standard Oil Co., Talladega, Ala.
C-36	Mineral Spirits #12				100		160-210	Anderson Prichard Oil Co., Newark, N. J.
C-37	Naphtha, Cleaners				100		155-220	
C-38	Naphtha, V M & P	11			89		112-141	Jamison Oil Co., Omaha, Nebr.
C-39	Nu-film #22	10		70	20		65-140	Cook Paint and Varnish Co., Omaha, Nebr.
C-40	O'Brien Lacquer Thinner L-156-XX	3		40	57			O'Brien Varnish Co., South Bend, Ind.
C-41	Paco Solvent (denatured alcohol)			100			75-100	Industrial Chemical Co., Omaha, Nebr.
C-42	Paint and Varnish Remover	50		50			64-75	V. J. Dolman and Co., Chicago, Ill.
C-43	Penotrite		20		80		139-186	General Solvents, Rochester, N. Y.
C-44	Ponsolve			100			73-79	E. I. duPont, Wilmington, Del.
C-45	Rifle Bore Cleaner				80	Water	76-260	S. C. Johnson & Son, Inc., Racine, Wis.
C-46	Shamrock Solvent				100		160-200	Shamrock Oil & Gas, Amarillo, Tex.
C-47	Shellacol			100			78 app.	Shell Oil Co., New York, N. Y.
C-48	Solvasol #5 (Varnoline)				100		160-190	Socony Vacuum Oil Co., New York, N. Y.
C-49	Solvental				94	Soap	185-245	Solvental Chemical Products Co., Pittsburgh, Pa.
C-50	Sovalsol, Magnolia				100		160-200	Magnolia Petroleum Co., Amarillo, Tex.
C-51	Stanisol Solvent Mixture				100		150-200	Standard Oil Co., New York, N. Y.
C-52	Stoddard Solvent				100		157-188	Phillips Petroleum Co., St. Louis, Mo.
C-53	Stoddard Solvent				100		150-200	W. J. Hough Co., Chicago, Ill.
C-54	Stoddard Solvent				100		145-195	Aetna Oil Co., Louisville, Ky.
C-55	Synosol			100			84 app.	Cook Paint & Varnish Co., Chicago, Ill.
C-56	Testors Thinner			60	40		60-110	Testor Chemical Co., Rockford, Ill.
C-57	Tomac Thinner				100		60-210	American Hospital Supply Co., Chicago, Ill.
C-58	Tri Sol		45		55		82-209	Bertram Naphtha Co., Kansas City, Mo.
C-59	Type Wash	39		38	23		64-142	Barco Chemical Products Co., Chicago, Ill.
C-60	Varnish and Paint Remover	50		50			64-75	V. J. Dolman & Co., Chicago, Ill.
C-61	Varsol				100		150-200	Standard Oil Co., New York, N. Y.
C-62	V M and P Naphtha	11			89		112-141	Jamison Oil Co., Omaha, Nebr.
C-63	Washurite		25	5	70		61-170	Davidson Mfg. Co., Chicago, Ill.

TABLE 2.—*Organic solvents used as thinners*

Code No.	Name or trade name of product	Composition (percent): Aromatics (mac. 50–200 p. p. m.)	Composition (percent): Alcohols, esters, ethers, and ketones (mac. 200–400 p. p. m.)	Composition (percent): Paraffins and naphthenes (mac. 500–1,000 p. p. m.)	Boiling range (° C.)	Supplier or manufacturer
T- 1	Acme Paint Thinner	25	60	15	70–125	Pittsburgh Auto Equipment Co., Meadville, Pa.
T- 2	AMI Thinner			100	100–250	
T- 3	ANA Thinner (enamel)		100		82–128	Sewell Paint Co., Kansas City, Mo.
T- 4	Apco Thinner	14		86	122–147	Bertram Naphtha Co., Kansas City, Mo.
T- 5	Bitumastic Thinner			100	151–191	McJunkin Supply Co., Charleston, W. Va.
T- 6	Black Nitrocellulose Lacquer Enamel	10	50	40	70–140	Wabash Products Co., Terre Haute, Ind.
T- 7	Black Stencil Paint Thinner			100	158–195	Phelan Faust, St. Louis, Mo.
T- 8	Brit-Mark Stencil Ink Thinner		65	35	125–180	Diagraph Bradley Stencil Machine Corp., St. Louis, Mo.
T- 9	Butyl Cellosolve Thinner		100		171	Carbide and Carbon Chemical Corp., New York, N. Y.
T-10	Carbitol		100		198	Do.
T-11	Cellulose Nitrate Lacquer Thinner		60	40	70–125	Pittsburgh Plate Glass Co., South Bend, Ind.
T-12	Chocolate Brown Lacquer Thinner	5	50	45	65–120	Jones-Dabney, Louisville, Ky.
T-13	Chromated Lacquer Thinner (Reducer #66)	100				Grand Rapids Varnish Co., Grand Rapids, Mich.
T-14	Duco #3614		60	40	37–147	E. I. duPont Co., Wilmington, Del.
T-15	Duco Thinner (K-1486)	29	42	29	64–142	Arthur Fulmer, Memphis, Tenn.
T-16	DuPont #200 Paint Thinner	55		45	187–226	Koch's Paint & Supply Co., Burlington, Iowa.
T-17	DuPont #3322 Lacquer Thinner	30	50	20	75–139	E. I. duPont Co., Wilmington, Del.
T-18	DuPont Lacquer Thinner #3673		45	55	85–180	Do.
T-19	DuPont "Red" Thinner #3450		70	30	60–120	E. I. duPont Co., Dallas, Tex.
T-20	DuPont Synthetic Reducer (T-8879)			100	80–125	The W. E. Wright Co., Akron, Ohio.
T-21	DuPont Synthetic Reducer (T-8879)	25		75	136–204	E. I. duPont Co., St. Louis, Mo.
T-22	DuPont Thinner Mix		50	50		E. I. duPont Co., Wilmington, Del.
T-23	Enamel Thinner			100	90–120	Sewell Paint & Varnish Co., Dallas, Tex.
T-24	Ethyl Cellulose Lacquer Thinner	15	50	35	78–143	Sewell Paint & Varnish Co., Kansas City, Mo.
T-25	Gensol		Turpentine		145–175	Newport Industries, Cincinnati, Ohio.
T-26	Glyptal Thinner	73		27	126–143	General Electric Supply Co., Pittsburgh, Pa.
T-27	Hydro #1—Reducing—Spec. #2	75		25	100–145	Western Rosin & Turpentine Co., Detroit, Mich.
T-28	Hydro Flex #195 Paint Thinner	22		78	118–187	Phelen-Faust Paint Mfg. Co., St. Louis, Mo.
T-29	Ink Paste Thinner			100	165–201	Howard Flint Ink Co., Houston, Tex.
T-30	Ink Reducer	1		99	153–205	Howard Flint Ink Co., Detroit, Mich.

T-31	Ink Thinner #77		100		77-97	The Superior Type Co., Chicago, Ill.
T-32	Insulating Varnish Thinner #5052	97		3	79-126	Westinghouse Electric Supply Co., Pittsburgh, Pa.
T-33	Japan Dryer			100	150-210	
T-34	Lacquer Enamel Thinner	35	40	25	70-135	O'Brien Varnish Co., South Bend, Ind.
T-35	Lacquer Thinner	45	25	30		Do.
T-36	Lacquer Thinner	20	50	30		Cook Paint & Varnish Co., Houston, Tex.
T-37	Lacquer Thinner	11	51	38	69-134	Pittsburgh Plate Glass Co., St. Louis, Mo.
T-38	Lacquer Thinner	15	45	40	72-137	Gilman Paint & Varnish Co., Chattanooga, Tenn.
T-39	Lacquer Thinner 250-C-636	15	55	30	75-140	Cook Paint & Varnish Co., Houston, Tex.
T-40	Lacquer Thinner #1055A	2	72	26	78-120	Sewell Paint & Varnish Co., Kansas City, Mo.
T-41	Lacquer Thinner #1173B	20	52	28	79-141	P. D. George Co., St. Louis, Mo.
T-42	Lacquer Thinner (FL-19830)	15	60	25	80-139	Pittsburgh Plate Glass Co., St. Louis, Mo.
T-43	Lacquer Thinner (FL-20300)	5	60	35	72-135	Pittsburgh Plate Glass Co., Birmingham, Ala.
T-44	Lacquer Thinner (U. L. 10045)	15	60	25	70-140	O'Brien Varnish Co., South Bend, Ind.
T-45	Mineral Spirits			100	156-198	Standard Oil Co., Huntsville, Ala.
T-46	Naphtha	5		95	88-150	
T-47	Naphtha	10		90	96-143	Jamieson Oil Co., Omaha, Nebr.
T-48	Nitrocellulose Lacquer Thinner	45	35	20	75-140	F. J. Donahoe Varnish Co., Detroit, Mich.
T-49	Nitrocellulose Nitrate Dope Thinner	30	55	15	75-140	Grand Rapids Varnish Co., Grand Rapids, Mich.
T-50	N. R. O. Thinner	3	70	27	67-121	E. I. duPont Co., Wilmington, Del.
T-51	O'Brien Lacquer Thinner (L-165-3)	46	30	24		O'Brien Varnish Co., South Bend, Ind.
T-52	Paint #29232A Thinner			100	98-136	Pittsburgh Plate Glass Co., Cleveland, Ohio.
T-53	Pentol O. D. Enamel Thinner	20	10	70		Sewell Paint & Varnish Co., Kansas City, Mo.
T-54	Phenolic Thinner		100			Stoner & Nudge Co., Pittsburgh, Pa.
T-55	Pittsburgh Minimax		36	64		Pittsburgh Plate Glass Co., Pittsburgh, Pa.
T-56	Pyroxyline Thinner	4	55	41		S. C. Johnson & Son, Inc., Racine, Wis.
T-57	Red Lacquer Thinner	15	50	35	68-145	Pittsburgh Plate Glass Co., Memphis, Tenn.
T-58	Reducer #74			100	145-205	Sherwin-Williams Paint Co., Baltimore, Md.
T-59	Sea Lac Lacquer Thinner	30	40	30	65-130	Duralac Chemical Corporation, Newark, N. J.
T-60	Sewell #3551 Paint Thinner	75		25	134-175	Sewell Paint & Varnish Co., Kansas City, Mo.
T-61	Sherwin-Williams Paint Thinner	5		95	64-130	Sherwin-Williams Co., Dallas, Tex.
T-62	Sol Naphtha			100	160-194	Shell Petroleum Co., New York, N. Y.
T-63	Solox		100		77-107	McKesson-Robbins Co., Omaha, Nebr.
T-64	Solvesso #1 Thinner	60		40	85-135	Standard Oil Co., Norfolk, Va.
T-65	Solvesso #3	70		30	170-220	Colonial Beacon Oil Co., Springfield, Mass.
T-66	Solvesso—Sohio #1	70		30	90-140	Standard Oil Co., Akron, Ohio.
T-67	Special Fast Dry Stencil Thinner	18		82	111-141	Wm. H. Witte & Sons Paint Co., Burlington, Iowa.
T-68	Spruance Thinner	7	55	38	68-140	Gilbert Spruance Co., Philadelphia, Pa.
T-69	Stencil Thinner Solvent #50	25	65	10	50-195	Garvey Fountain Brush & Ink Co., St. Louis, Mo.
T-70	Superior #77 Ink Thinner		100		80-200	The Superior Type Co., Chicago, Ill.
T-71	Synthetic Enamel Thinner	40		60	135-200	
T-72	Synthetic Thinner for O. D. Paint			100	90-145	Rinshed Mason Co., Detroit, Mich.
T-73	Synthetic Thinner—Latex		60	40	70-165	Dyke Motor Supply Co., Akron, Ohio.
T-74	Thinner #30	60	40		56-125	Graybar Electric Co., Newark N. J.
T-75	Thinner #74			100	160-210	Sherwin-Williams Co., Des Moines, Iowa.

TABLE 2.—*Organic solvents used as thinners*—Continued

Code No.	Name or trade name of product	Composition (percent)			Boiling range (° C.)	Supplier or manufacturer
		Aromatics (mac. 50-200 p. p. m.)	Alcohols, esters, ethers, and ketones (mac. 200-400 p. p. m.)	Paraffins and naphthenes (mac. 500-1,000 p. p. m.)		
T-76	Thinner, Acid Proof Black Paint	15		85	120-147	Testor Chemical Co., Rockford, Ill.
T-77	Thinner, Cooks	20	50	30		Cook Paint & Varnish Co., Houston, Tex.
T-78	Thinner, G. E. #1500	70		30	105-145	Graybar Electric Co., Newark, N. J.
T-79	Thinner, Lacquer #20	22	52	26	69-153	Acme White Lead & Color Works, Detroit, Mich.
T-80	Thinner, Lacquer (du Pont) (3-162-1)	21	32	47		E. I. duPont, Co., Wilmington, Del.
T-81	Thinner, Lacquer Enamel (3-162-A)	20	50	30	70-130	Wabash Products Co., Terre Haute, Ind.
T-82	Thinner, Lacquer Enamel (Cooks)	34		66	67-141	Cook Paint & Varnish Co., Kansas City, Mo.
T-83	Thinner, Lacquer Enamel (Nitro Cellulose)		60	40		S. C. Johnson & Son., Inc., Racine, Wis.
T-84	Thinner, Marking Ink #4		100		124	Hilton Hawley Co., Cincinnati, Ohio.
T-85	Thinner—Paint (#76)	10	65	25		
T-86	Thinner, Pedigree #150	100			133-151	H. A. Holden, Inc., Minneapolis, Minn.
T-87	Thinner, Testor's	26	33	41		Testor Chemical Co., Rockford, Ill.
T-88	Thinner, Witte's Lacquer Thinner	26	30	44	82-124	Wm. H. Witte & Sons Paint Co., Burlington, Iowa.
T-89	V. M. & P. Naphtha	5		95	98-176	Socony Vacuum Co., St. Louis, Mo.
T-90	Warren's Deodorized Leptine			100	165-210	Warren Paint and Color Co., Nashville, Tenn.
T-91	Wash #5816 Thinner	10	75	15	70-140	George Rutledge Co., Montclair, N. J.
T-92	Westinghouse #8110 Thinner		100		73-107	Westinghouse Electric Supply Co., Pittsburgh, Pa.
T-93	Westinghouse Tuffernell Thinner 1609	3		97	155-196	Westinghouse Electric Supply Co., St. Paul, Minn.
T-94	Xylol Solvesso	100			135-180	Standard Oil Co., Akron, Ohio.
T-95	Zapon Cotite A	15	80	5	70-130	Zapon Division, Atlas Powder Co., Philadelphia, Pa.

concentrations in the range of 50 to 200 p. p. m. Examples are carbon tetrachloride, trichloroethylene, and dichlorobenzene.

3. ALCOHOLS, ESTERS, ETHERS, AND KETONES: These chemical groups are less toxic than 1 and 2. Most of those encountered in the samples analyzed fall into a maximum allowable concentration toxicity range of 200 to 400 p. p. m. Examples are acetone, methyl ethyl ketone, the alcohols, and the acetates.

4. PARAFFINS AND NAPHTHENES: This group is not particularly toxic. It includes materials such as gasoline, Stoddard solvent, petroleum naphtha, and V M and P naphtha. The maximum allowable concentrations for the materials in this group range from 500 to 1,000 p. p. m.

In addition to the substances described in paragraphs 1, 2, 3, and 4 above, some of the products listed in table 3 contain other ingredients. These are of little concern, as a rule, from the inhalation viewpoint but are of importance as regards skin contact. Free alkali and various acids may produce burns or dermatitis if brought in contact with the skin, and others may act as sensitizers and cause allergic eczema.

The results of the analyses were classified as described above because it was felt that this arrangement would be more useful to the majority of personnel than would the actual specific analyses. Hence, an estimate of the danger associated with using a given product may be obtained by noting what percentages of the ingredients fall in the more toxic groups, and observing the boiling range. It should be emphasized that for many operations the boiling range is important and high boiling products should be selected in preference to low boiling ones since, other things being equal, the natural evaporation rate decreases as the boiling point increases and the atmospheric concentration of the vapors of the ingredients will therefore be lower with the higher boiling products.

The data contained in tables 1, 2, and 3 make it possible for personnel of the medical and safety departments to estimate the degree of hazard associated with the use of any of the products investigated; and those in table 4 make it possible to select a less toxic substitute for the same operation.

Even though the data in this paper pertain largely to the health hazard associated with the use of these materials, it must be remembered that most solvents, thinners, and cleaners with the exception of the halogenated hydrocarbons also present important fire and explosion hazards. As a rule the proper control of the health hazard will automatically control the fire or explosion hazard but such is not always the case. It is necessary, therefore, that adequate precautions be taken to prevent the existence or creation of a fire hazard. The potential fire and explosion hazard is influenced greatly by the flash point and by the boiling point of the material used; hence these factors as well as the toxicity must be taken into consideration when selecting the best product for a given operation or use.

TABLE 3.—*Materials or products used for cleaning, degreasing, cementing, or finishing operations*

Code No.	Name or trade name of material	Composition [1]									Boiling range (° C.)	Supplier or manufacturer
		Aromatics (mac. 50–200 p.p.m.)	Halogenated hydrocarbons (mac. 50–200 p.p.m.)	Alcohols, esters, ethers, ketones (mac. 200–400 p.p.m.)	Paraffins and naphthenes (mac. 500–1,000 p.p.m.)	Free alkali	Alkaline salts	Detergents and soap	Water	Other		
M-1	Apex						36	7	x	Neutral salts		Apex Alkali Products Co., Philadelphia, Pa.
M-2	Bendix Cleaner		22	8	35					Cresylic acid	70–255	Chain Battery & Auto Supply Co., Shreveport, La.
M-3	Blufilm No. 30	5		60	35						35–94	Sherwin-Williams Paint Co., Baltimore, Md.
M-4	Brex						83	13	4			Rudolph Ramelli Co., Milan, Tenn.
M-5	Carbon Remover Solvent	Walter solution containing chromate and cresol										
M-6	Carbon Remover Solvent		55					15	5	Cresylic acid	98–226	San Antonio Arsenal, San Antonio, Tex.
M-7	Cassite (Penetrating Oil)									High boiling oil		Reichman Crosby & Co., Memphis, Tenn.
M-8	Cowles Cleaner (metal cleaner).					32	46	14		Neutral salts		Cowles Detergent Co., Cleveland, Ohio.
M-9	Dearborlene									High boiling oil	175–350	Dearborn Chemical Co., Chicago, Ill.
M-10	Deoxit		Water solution of acid salt									Multigraph Sales Co., Erie, Pa.
M-11	Duosol Ameroid				25			x	10	Cresylic acid		Third Service Command Shop, Reading, Pa.
M-12	Enn-Jay Naphtha (xylol)	90			10						130–145	Standard Oil Co. of New York.
M-13	Ferrocote #360				53				2	Residue		Quaker Chemical Products Co., Conshohocken, Pa.
M-14	Fuzee (motor cleaner & carbon remover).		40						5	Sulfonated oil	52–194	Turco Products Co., Atlanta, Ga.
M-15	Gunk				40			10	40	Cresols	90–205	Curran Corp., Malden, Mass.
M-16	Gunk—960A Concentrate		2					3	93	do		
M-17	Keelite AAF Star		35	25				x	30	Cresylic acid	60–210	Kelite Products Inc., Huston, Tex.
M-18	Keelite #24 Cleaner					19	73		8			Do.
M-19	Keelite 50 (motor cleaning compound).					14	46	15	25			Do.
M-20	Keelite (radiator cleaning compound).					13	10	10	65	Glycol		Do.
M-21	Keelite Superfoam							4	96		98–144	Do.
M-22	Keelite Texol Cleaner		10		45			35	10		70–245	Do.

M-23	Keepeze	Water solution of mucilage										Multigraph Sales Co., Birmingham, Ala.
M-24	Kendal Thin Film (AXS 673)				60					Residue		
M-25	Kermeed					15	62	7	16			Clayton Mfg. Co., Alhambra, Calif.
M-26	Ketrex (asphalt removing compound).		35		15				10	Cresylic acid	60–270	Kelite Products Inc., Houston, Tex.
M-27	Nufilm No. 22			70	30						51–125	Sherwin-Williams Paint Co., Baltimore, Md.
M-28	Penetone							x	x	Residue, 25		The Penetone Co., Tenefly, N. J.
M-29	Penetone Senior							x	x	Residue, 30		Do.
M-30	Penetrol		20					x	35	Cresylic acid		Turco Products Co., Los Angeles, Calif.
M-31	Platex	Water solution of salts and glycerin										Multigraph Sales Co., Erie, Pa.
M-32	Prepikl #4580 Rust Remover			3					42	H_3PO_4–35; $ZnCl_2$–15		Neilson Chemical Co., Detroit, Mich.
M-33	Repelex	Water solution of salts and glycerin										Multigraph Sales Co., Erie, Pa.
M-34	Ridolene #23 Metal Cleaner				41	36			23			American Chemical Paint Co., Ambler, Pa.
M-35	Rust Preventive Compound		(Insoluble in water)									Allied Products Co., Chicago, Ill.
M-36	3-Zyglo Solution Solvent							x	x	Siliceous material		

[1] Numbers indicate percent of ingredient present, and x indicates presence of ingredient in undetermined amount.

TABLE 4.—*List of products by operation or use*

Operation or use	Solvents or cleaners used
Affixing stencils to silk screens	M-3, M-27.
Ammunition reconditioning	C-9, T-13, T-49, T-64.
Ammunition renovation	C-9, T-13, T-49, T-64.
Asphalt removal	M-22.
Carbon removal	C-7, C-12, C-31, C-33, M-2, M-5, M-6, M-14.
Cleaning automobiles	M-18, M-21.
Cleaning auto parts	C-11, C-35, M-5, M-6.
Cleaning bombs	C-42, C-60, C-62.
Cleaning brushes	C-29, T-71.
Cleaning carbon	C-7, C-12, C-31, C-33, M-2, M-5, M-6, M-14.
Cleaning carburetors	C-34, M-2.
Cleaning clocks	C-23.
Cleaning components	C-42, C-48, C-60, C-61, T-49.
Cleaning Davidson machine mats	C-63.
Cleaning Ditto machines	C-16.
Cleaning electric motors	C-16.
Cleaning equipment	C-4, C-15, C-27, T-45, T-55, M-16, M-34.
Cleaning gages	C-13, C-27, C-52, C-53.
Cleaning, general purpose	C-10, C-19, C-27, C-35, C-41, C-52, C-53, C-55, C-61, T-45, M-34.
Cleaning ignition points	C-35.
Cleaning instruments	C-23, C-34.
Cleaning lithograph plates	C-30.
Cleaning machine parts	C-4, C-27, C-35, C-46, C-51, C-52, C-53.
Cleaning mechanical equipment	C-4, C-15, C-27, M-16, M-34.
Cleaning motors	C-7, C-14, M-14, M-19.
Cleaning multilith machines, plates, and rolls.	C-6, M-10, M-31, M-33.
Cleaning office machines	C-52, C-53.
Cleaning ordnance materiel	C-3, C-11, M-1.
Cleaning paint brushes	C-29, C-40, C-42, C-60.
Cleaning paint fixtures	C-29, C-40, C-42, C-60, M-30.
Cleaning press rolls	C-42, C-60.
Cleaning primer assembly	C-52, C-53.
Cleaning production parts	C-29, C-43, M-28, M-29, M-36.
Cleaning radiators	M-20.
Cleaning, renovation	C-9, C-42, C-60, M-1, M-7, M-32.
Multilith machines, operation	M-31.
Multilith machines, plates and rolls, cleaning.	C-6, M-10, M-31, M-33.
Operating multilith machines	M-31.
Paint remover	C-42, C-60, T-13.
Preserving multigraph plates	M-23.
Preserving ordnance material	C-11, M-1, M-9, M-13, M-24.
Preserving small arms	M-1, M-9, M-13, M-24, M-35.
Protecting against acid or corrosion	C-2.
Removing carbon	C-7, C-12, C-31, C-33, M-2, M-5, M-6, M-14.
Removing dry ink from press rolls	C-42, C-60, T-43.
Removing enamel	C-42, C-60, T-13, T-23.
Removing fingerprints	C-21.
Removing ink	C-16, C-25, C-42, C-60, T-43.
Removing lacquer	C-42, C-57, C-60, T-13.
Removing paint	C-42, C-60, T-13.
Removing rubber gaskets	M-12.
Removing rust	C-12, M-1, M-7, M-32.
Removing stencils	C-18.
Renovation	C-9, C-12, T-13, T-49, T-64, M-35.
Rifle bore cleaner	C-45.
Rumbling cartridges	C-5, C-8.
Rust-proofing ordnance materiel	M-9, M-13, M-24, M-35.
Rust remover	C-12, M-1, M-7, M-32.
Solvent and dryer	T-33.
Stencil paint and ink remover	C-25, C-59.
Thinner, acid proof black paint	T-66, T-76.
Thinner, acid resisting enamel	T-3, T-76.
Thinner, antipaint-bubbling	T-94.
Thinner, auto paint	T-1, T-73, T-74, T-79.
Thinner, bullet tipping lacquer	T-24, T-40.
Thinner, China-wood oil finish	T-65.
Thinner, completed rounds ink	T-70.
Thinner, completed rounds lacquer enamel.	T-23, T-34.
Thinner, completed rounds paint	T-11.
Thinner, components cements	T-10.

Cleaning rifle bores	C-45.
Cleaning rubber printing rolls	C-6.
Cleaning rubber stamps	C-36.
Cleaning rust	C-12, M-1, M-7, M-32.
Cleaning scales	C-23.
Cleaning shells	C-42, C-60, C-62.
Cleaning silk screens	C-18, C-39.
Cleaning spray booths	C-40, M-30.
Cleaning stencil ink	C-25.
Cleaning stencil screens	C-18, C-39.
Cleaning stencil type	C-59.
Cleaning tetryl	C-26.
Cleaning tools	C-14, C-27, C-48, C-52, C-53, C-55, M-17.
Cleaning tracer machines	C-58.
Cleaning truck bodies	M-26.
Cleaning type	C-35, C-59.
Cleaning typewriters	C-24, C-28, M-15.
Cleaning vehicles	M-8, M-18.
Cleaning zinc plates	C-6.
Components renovation	C-48, C-61, T-10, T-11, T-13, T-49.
Degreasing clocks	C-23.
Degreasing floors	C-1.
Degreasing, general purposes	C-10, C-27, C-35, C-49, C-52, C-53, C-61, M-11, M-15.
Degreasing instruments	C-23.
Degreasing motors	C-14.
Degreasing parts	C-27, M-4, M-28, M-29, M-34, M-36.
Degreasing scales	C-23.
Degreasing tools	C-14, C-27, C-48, M-34.
Degreasing watch parts	C-22.
Ditto machine operation	C-16.
Dry cleaning	C-17, C-19, C-20, C-32, C-50.
Dryer and solvent	T-33.
Enamel remover	C-42, C-60, T-13, T-23.
Experimental purposes	T-14.
Finger print remover	C-21.
Finishing ordnance material	C-3, C-11, M-1, M-9, M-13, M-24.
Grease removal	C-1, M-18.
Ink remover	C-16, C-25, C-42, C-60, T-43.
Lacquer remover	C-42, C-57, C-60, T-13.
Metal sealing	M-12.
Thinner, components paints	T-10, T-57.
Thinner, core lacquer	T-43.
Thinner, "duPont Red"	T-19.
Thinner, electric motor paint	T-26, T-92, T-93.
Thinner, enamel	T-6, T-34, T-51, T-53, T-71, T-82, T-83, T-89.
Thinner, fins and shells paint	T-6, T-39, T-52, T-72, T-80, T-88, T-89.
Thinner, fuze paint	T-11, T-57.
Thinner, hot surfaces paint	T-5, T-53, T-82, T-83.
Thinner, ink	T-2, T-8, T-10, T-43, T-69, T-70, T-84.
Thinner, insulation varnish	T-26, T-32, T-59.
Thinner, interior enamel	T-51.
Thinner, lacquer	T-12, T-17, T-18, T-35, T-36, T-37, T-38, T-40, T-41, T-43, T-44, T-48, T-50, T-54, T-68, T-71, T-74, T-77, T-78, T-79, T-80, T-87, T-95.
Thinner, load line enamel	T-23, T-34, T-82, T-83, T-87.
Thinner, maintenance paint	T-20, T-21, T-60, T-73, T-90.
Thinner, marking inks	T-2, T-8, T-9, T-30, T-69, T-84.
Thinner, metal sealing compound	T-19.
Thinner, motor insulating paint	T-26, T-32, T-59, T-86, T-92, T-93.
Thinner, motor winding paint	T-26, T-32, T-86, T-92, T-93.
Thinner, Navy tracer paint	T-56.
Thinner, nitrocellulose lacquer	T-6, T-48, T-83.
Thinner, N. R. C. lacquer	T-37, T-50.
Thinner, O. D. shell and bomb paint	T-88, T-89.
Thinner, paint	C-52, C-53, T-4, T-6, T-10, T-12, T-15, T-16, T-25, T-27, T-28, T-39, T-40, T-45, T-46, T-47, T-52, T-72, T-76, T-80, T-88, T-89.
Thinner, Pittman cement	T-63.
Thinner, silk screen	T-91.
Thinner, silk screen reproduction paint.	T-58, T-91.
Thinner, small arms repack paint	T-12.
Thinner, stencil ink	T-2, T-8, T-9, T-29, T-30, T-31, T-69, T-84.
Thinner, stencil paint	T-7, T-29, T-30, T-31, T-67.
Thinner, synthetic lacquer	T-55.
Thinner, wooden box paint	T-75.
Varnish remover	C-42, C-60.
Washing automobiles	M-21.

TUBERCULOSIS MORTALITY IN EACH STATE, 1944

The Bureau of the Census, on February 1, 1946, released the figures showing the number of deaths from tuberculosis (all forms) in each State and the death rates for 1944. In the table below are shown the number

Number of deaths from tuberculosis (all forms), death rates, and percent changes in rates, by State: United States, 1939–41 average, 1942, 1943, and 1944

[By place of residence]

Area	Number of deaths				Rate per 100,000 population				Percent change in rates		
	1944	1943	1942	1939–41 average	1944	1943	1942	1939-41 average	1943 to 1944	1939–41 to 1944	1939–41 to 1942–44
United States	54,731	57,005	57,690	60,429	41.3	42.6	43.1	45.8	−3.1	−9.8	−7.6
Alabama	1,269	1,302	1,285	1,518	45.0	45.0	43.7	53.4	0	−15.7	−16.5
Arizona	784	690	675	724	122.9	98.2	122.7	144.3	+25.2	−14.8	−21.3
Arkansas	826	939	1,029	1,009	46.5	50.2	52.0	51.7	−7.4	−10.1	−3.9
California	3,826	3,872	3,876	3,838	43.7	45.7	50.5	55.1	−4.4	−20.7	−15.6
Colorado	419	471	495	503	36.5	40.5	44.6	44.7	−9.9	−18.3	−9.4
Connecticut	661	621	633	616	37.2	34.9	35.5	35.9	+6.6	+3.6	0
Delaware	123	111	146	152	43.3	39.5	52.3	56.9	+9.6	−23.9	−20.9
District of Columbia	547	533	551	548	58.6	59.9	63.7	80.0	−2.2	−26.8	−24.1
Florida	823	855	870	944	34.7	36.1	40.7	49.4	−3.9	−29.8	−24.9
Georgia	1,141	1,332	1,295	1,510	35.4	41.3	40.2	48.2	−14.3	−26.6	−19.1
Idaho	109	93	86	99	20.4	18.7	18.0	18.8	+9.1	+8.5	+1.6
Illinois	3,218	3,349	3,338	3,663	41.6	43.5	41.6	46.3	−4.4	−10.2	−8.6
Indiana	1,221	1,248	1,281	1,398	35.7	36.7	36.7	40.7	−2.7	−12.3	−10.6
Iowa	341	395	427	450	15.0	17.0	17.6	17.7	−11.8	−15.3	−6.2
Kansas	357	345	438	423	20.1	19.4	25.0	23.6	+3.6	−14.8	−8.9
Kentucky	1,726	1,785	1,841	1,961	65.7	65.3	66.0	68.7	+.6	−4.4	−4.5
Louisiana	1,158	1,290	1,211	1,347	45.7	50.5	47.5	56.8	−9.5	−19.5	−15.7
Maine	279	275	258	268	35.2	33.6	31.2	31.7	+4.8	+11.0	+5.0
Maryland	1,326	1,277	1,311	1,268	62.3	61.0	65.7	69.4	+2.1	−10.2	−9.2
Massachusetts	1,698	1,819	1,630	1,623	40.8	42.7	37.5	37.6	−4.4	+8.5	+7.2
Michigan	1,814	1,869	1,891	1,828	33.4	34.5	34.2	34.7	−3.2	−3.7	−2.0
Minnesota	693	719	693	758	27.6	27.9	26.0	27.1	−1.1	+1.8	+.4
Mississippi	831	912	1,113	1,074	38.2	40.9	50.0	49.0	−6.6	−22.0	−12.2
Missouri	1,487	1,659	1,574	1,783	41.4	44.2	41.4	47.1	−6.3	−12.1	−10.0
Montana	175	206	201	235	37.6	42.5	39.0	42.0	−11.5	−10.5	−5.5
Nebraska	211	208	180	225	17.4	16.9	14.5	17.1	+3.0	+1.8	−4.7
Nevada	76	89	80	70	48.6	62.1	58.9	63.7	−21.7	−23.7	−11.8
New Hampshire	105	136	102	133	23.0	29.5	21.1	27.0	−22.0	−14.8	−9.3
New Jersey	1,856	1,932	1,882	1,852	44.5	45.6	44.0	44.4	−2.4	+.2	+.7
New Mexico	345	353	303	357	64.9	66.1	57.3	66.8	−1.8	−2.8	−6.1
New York	6,055	6,335	6,073	6,244	47.9	49.3	46.8	46.3	−2.8	+3.5	+3.7
North Carolina	1,239	1,366	1,461	1,598	35.1	37.5	41.0	44.6	−6.4	−21.3	−15.0
North Dakota	86	123	121	127	16.3	22.7	20.7	19.8	−28.2	−17.7	+.5
Ohio	2,787	2,793	2,846	2,913	40.8	40.6	41.0	42.1	+.5	−3.1	−3.1
Oklahoma	880	932	982	1,104	42.6	43.0	44.4	47.3	−.9	−9.9	−8.5
Oregon	307	271	299	307	25.3	21.9	27.3	28.1	+15.5	−10.0	−12.1
Pennsylvania	4,020	4,080	4,187	4,231	43.5	43.1	43.0	42.7	+.9	+1.9	+1.2
Rhode Island	300	296	280	265	38.4	39.4	37.8	37.1	−2.5	+3.5	+4.0
South Carolina	660	689	805	876	34.4	35.3	39.9	45.9	−2.5	−25.1	−2.6
South Dakota	178	176	185	197	31.9	30.5	31.6	30.7	+4.6	+3.9	+2.0
Tennessee	1,881	1,980	2,082	2,298	65.6	66.9	70.8	78.6	−1.9	−16.5	−13.7
Texas	3,126	3,338	3,611	3,814	45.4	47.9	53.9	59.4	−5.2	−23.6	−17.5
Utah	73	71	82	86	12.0	11.2	14.2	15.5	+7.1	−22.6	−20.0
Vermont	124	119	112	144	39.9	36.3	32.8	40.1	+9.9	−.5	−9.7
Virginia	1,344	1,449	1,632	1,628	42.0	47.1	54.0	60.5	−10.8	−30.6	−21.3
Washington	702	720	676	689	34.1	35.4	35.8	39.6	−3.7	−13.9	−11.4
West Virginia	764	769	765	880	44.6	43.8	41.6	46.1	+1.8	−3.3	−6.1
Wisconsin	726	776	759	806	24.4	25.8	24.3	25.6	−5.4	−4.7	−3.1
Wyoming	34	37	37	45	13.2	14.5	14.7	18.0	−9.0	−26.7	−21.1

of deaths and the death rates for each of the three war years, 1942, 1943, and 1944, and the average rate for the prewar period, 1939–41. In addition, the percentage changes in the rates from 1943 to 1944 and from 1939–41 to 1944, as well as the changes in the average rates from 1939–41 to the average rate for the period 1942–44 are shown.

A detailed report and analysis of all the mortality data for 1944 will be presented in a joint publication by the Division of Vital Statistics, United States Bureau of the Census, and the Tuberculosis Control Division, United States Public Health Service, in the April 5 issue of Public Health Reports.

DEATHS DURING WEEK ENDED JANUARY 5, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 5, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	11,928	9,786
Average for 3 prior years	11,353	
Deaths under 1 year of age	644	592
Average for 3 prior years	701	
Data from industrial insurance companies:		
Policies in force	67,179,698	66,913,713
Number of death claims	10,576	10,427
Death claims per 1,000 policies in force, annual rate	8.2	8.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 12, 1946

Summary

The incidence of influenza declined in all of the 9 geographic divisions except the Mountain and the Pacific, in which areas totals respectively of 4,028 and 871 cases were reported. A total of 32,635 cases was reported for the country as a whole as compared with 48,041 last week, 4,132 and 65,649, respectively, for the corresponding weeks of 1945 and 1944, and a 5-year (1941–45) median of 4,330. Of 17 States reporting 200 or more cases for the week, only 5, with an aggregate of 5,217 cases, reported increases. These are as follows (last week's figures in parentheses): Arkansas 1,249 (1,204), Idaho 823 (79), Colorado 209 (195), Utah 2,284 (1,114), California 652 (436). The total for the first 2 weeks of the year is 80,676, as compared with 8,719 and 192,355 for the first 2 weeks of 1945 and 1944, respectively, and a 5-year median of 8,719.

A total of 262 cases of meningitis was reported, as compared with 189 last week, 645 for the corresponding week of 1944, and a 5-year median of 251 (reported for the corresponding week last year). States reporting more than 10 cases each are as follows (last week's figures in parentheses): New York 28 (14), New Jersey 11 (15), Pennsylvania 16 (7), Ohio 15 (10), Illinois 27 (9), Mississippi 13 (1), Texas 14 (13), California 23 (21). The total for the year to date is 451, as compared with 489 and 1,225, respectively, for the same periods of 1945 and 1944.

One case of dengue fever was reported for the week in Oregon.

A total of 11,668 deaths was recorded during the week in 93 large cities of the United States, as compared with 11,928 last week, 9,912 for the corresponding week of 1945 and a 3-year (1944–45) average of 10,642. The total for the first 2 weeks of the year is 23,596, as compared with 19,698 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended January 12, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945	
NEW ENGLAND												
Maine	4	4	0	11	-------	1	3	4	70	1	0	2
New Hampshire	0	0	0	1	-------	-------	12	1	3	0	0	0
Vermont	0	0	0	83	-------	-------	4	8	14	0	1	0
Massachusetts	4	6	2	-------	-------	-------	262	71	358	6	8	8
Rhode Island	0	0	2	9	76	13	1	7	9	0	0	0
Connecticut	14	1	0	83	2	4	17	61	61	4	4	4
MIDDLE ATLANTIC												
New York	16	7	16	[1] 44	[1] 1	[1] 22	855	52	852	28	25	23
New Jersey	8	3	3	69	12	26	53	18	331	11	16	8
Pennsylvania	26	16	14	15	5	2	399	47	1,463	16	20	16
EAST NORTH CENTRAL												
Ohio	31	8	8	34	9	35	41	25	84	15	14	2
Indiana	11	7	14	113	9	26	46	7	63	2	5	2
Illinois	6	4	7	29	2	21	485	37	176	27	9	4
Michigan [2]	6	15	7	17	-------	5	383	19	135	10	9	3
Wisconsin	0	3	1	524	9	61	69	33	437	7	4	2
WEST NORTH CENTRAL												
Minnesota	6	8	4	3	-------	2	6	5	14	3	2	0
Iowa	1	6	10	-------	-------	-------	3	16	100	1	2	0
Missouri	6	5	5	39	6	10	210	7	43	6	5	5
North Dakota	1	18	2	68	-------	46	-------	5	11	0	1	1
South Dakota	4	0	2	164	-------	-------	19	2	9	2	3	1
Nebraska	6	11	1	39	31	28	20	21	11	0	1	1
Kansas	4	4	4	253	2	16	146	19	68	1	4	4
SOUTH ATLANTIC												
Delaware	0	0	0	-------	-------	-------	1	17	13	0	1	0
Maryland [2]	25	2	6	30	4	22	22	9	12	4	7	10
District of Columbia	0	0	1	2	1	4	8	11	11	0	3	1
Virginia	14	7	10	3,975	404	489	159	6	141	10	7	7
West Virginia	6	1	7	577	9	14	15	17	17	8	1	1
North Carolina	24	17	16	-------	-------	17	36	23	94	10	3	3
South Carolina	6	7	5	2,218	616	854	107	11	70	0	8	3
Georgia	9	10	9	253	50	157	9	21	26	2	1	1
Florida	18	13	4	4	4	14	32	17	17	0	10	1
EAST SOUTH CENTRAL												
Kentucky	4	4	8	178	47	47	181	9	152	6	3	3
Tennessee	14	9	5	583	52	92	68	88	88	6	4	4
Alabama	5	15	8	1,768	109	281	15	19	27	7	8	4
Mississippi [2]	18	12	9	-------	-------	-------	-------	-------	-------	13	5	2
WEST SOUTH CENTRAL												
Arkansas	11	9	9	1,249	107	212	18	17	51	3	3	1
Louisiana	9	9	5	5,221	6	9	22	18	20	3	5	3
Oklahoma	12	10	8	917	189	189	19	7	14	2	2	2
Texas	51	52	35	9,163	2,078	2,078	175	87	178	14	17	7
MOUNTAIN												
Montana	0	6	1	143	19	19	8	5	26	1	1	0
Idaho	1	3	0	823	1	2	227	5	10	3	1	0
Wyoming	0	0	0	-------	28	36	20	1	8	0	2	1
Colorado	13	7	7	209	27	68	83	7	108	1	2	2
New Mexico	1	2	2	3	-------	4	6	2	2	1	1	1
Arizona	3	1	1	565	166	166	5	7	39	1	1	2
Utah [2]	0	0	0	2,284	4	12	61	21	21	1	1	1
Nevada	0	0	0	1	-------	-------	15	5	3	0	0	0
PACIFIC												
Washington	2	4	4	-------	-------	5	245	32	50	2	9	9
Oregon	7	11	1	219	14	28	41	58	65	1	2	2
California	28	41	29	652	33	160	682	470	258	23	15	15
Total	435	378	330	32,635	4,132	4,330	5,314	1,455	8,266	262	251	251
2 weeks	893	739	702	80,676	8,719	8,719	8,083	2,434	16,407	451	489	489

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended January 12, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–44
	Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945		Jan. 12, 1946	Jan. 13, 1945	
NEW ENGLAND												
Maine	0	0	0	32	66	21	0	0	0	0	3	1
New Hampshire	0	0	0	13	5	9	0	0	0	0	0	0
Vermont	0	0	0	14	2	3	0	0	0	0	0	0
Massachusetts	0	1	1	183	403	299	0	0	0	0	1	1
Rhode Island	0	0	0	14	27	12	0	0	0	0	0	0
Connecticut	0	1	0	33	82	57	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	7	9	4	352	551	399	0	0	0	0	3	3
New Jersey	0	0	0	68	154	106	0	0	0	1	1	1
Pennsylvania	5	0	0	191	301	272	0	0	0	3	1	2
EAST NORTH CENTRAL												
Ohio	3	1	1	198	265	265	0	0	0	1	1	2
Indiana	0	1	1	73	120	101	0	1	1	1	0	2
Illinois	2	0	1	124	350	257	0	0	0	4	0	1
Michigan [2]	3	1	1	118	268	173	0	0	0	0	2	0
Wisconsin	0	0	0	91	141	141	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	1	1	63	56	77	0	0	0	0	1	1
Iowa	3	0	0	30	81	63	0	0	1	0	0	1
Missouri	0	0	1	56	101	92	0	0	1	2	0	1
North Dakota	0	2	0	12	23	15	0	0	0	0	0	0
South Dakota	0	0	0	10	32	32	0	1	0	0	0	0
Nebraska	0	0	0	28	148	38	0	0	0	0	0	0
Kansas	0	0	0	64	143	92	2	1	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	6	7	7	0	0	0	0	0	0
Maryland [2]	0	2	0	62	151	66	0	0	0	1	0	1
District of Columbia	0	0	0	14	46	25	0	0	0	0	0	0
Virginia	0	0	0	66	90	53	0	0	0	3	1	1
West Virginia	0	0	0	57	60	53	0	0	0	0	0	1
North Carolina	2	0	0	52	80	54	0	0	0	1	3	2
South Carolina	0	0	0	16	12	12	0	0	1	1	2	1
Georgia	0	0	1	13	29	24	0	0	0	2	4	4
Florida	3	1	0	8	14	7	0	0	0	1	2	2
EAST SOUTH CENTRAL												
Kentucky	0	0	0	43	36	70	0	0	0	1	0	1
Tennessee	1	1	1	42	83	58	0	1	0	2	1	1
Alabama	0	1	1	15	28	26	2	1	1	0	0	0
Mississippi [2]	0	1	0	17	37	10	0	0	0	1	2	1
WEST SOUTH CENTRAL												
Arkansas	2	0	1	8	16	10	0	0	0	0	0	2
Louisiana	0	0	0	10	21	8	0	0	0	4	4	4
Oklahoma	1	0	0	40	30	30	1	2	1	1	0	1
Texas	1	1	1	104	152	59	0	0	0	5	7	4
MOUNTAIN												
Montana	1	0	0	21	21	21	0	0	0	0	0	0
Idaho	0	0	0	13	57	25	0	1	0	0	1	0
Wyoming	1	0	0	9	12	10	0	0	0	0	0	0
Colorado	0	1	1	31	76	38	0	0	0	0	1	1
New Mexico	0	2	0	13	51	7	0	1	0	0	2	0
Arizona	1	1	0	11	25	9	0	0	0	1	3	2
Utah [2]	4	0	0	39	67	67	0	0	0	0	0	0
Nevada	0	0	0	0	3	0	0	0	0	0	0	0
PACIFIC												
Washington	1	1	1	27	82	38	0	0	0	0	1	1
Oregon	0	1	1	23	49	22	0	0	0	0	1	1
California	13	2	2	195	335	192	0	0	0	5	1	3
Total	54	32	32	2,722	4,989	3,637	5	9	16	41	49	59
2 weeks	101	84	73	5,105	8,911	7,094	9	21	24	81	81	117

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately as follows: North Carolina 1; California 2.

Telegraphic morbidity reports from State health officers for the week ended January 12, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Jan. 12, 1946	Whooping cough: Week ended— Nov. 25, 1945	Whooping cough: Median 1941–45	Week ended Jan. 12, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	43	34	34								
New Hampshire	10	5	3								
Vermont	34	48	32								2
Massachusetts	119	189	202				1				
Rhode Island	71	18	18								
Connecticut	83	101	101		2						1
MIDDLE ATLANTIC											
New York	346	232	473		2		1				9
New Jersey	183	92	164			4					1
Pennsylvania	157	173	310								1
EAST NORTH CENTRAL											
Ohio	64	93	221	1					2		
Indiana	19	7	23	3					1		1
Illinois	59	77	121	3					3		5
Michigan [2]	98	122	181	1	5						1
Wisconsin	56	74	91								1
WEST NORTH CENTRAL											
Minnesota	12	32	56	2	1						2
Iowa	5	7	22								6
Missouri	7	11	22								
North Dakota		4	13								
South Dakota	2	6	2								3
Nebraska		12	3								
Kansas	34	48	48								1
SOUTH ATLANTIC											
Delaware		3	3								
Maryland [2]	27	77	84			4			5		
District of Columbia	9	6	10								
Virginia	36	39	48			25			3		1
West Virginia	21	25	31								
North Carolina	79	77	85						2	2	
South Carolina	93	52	64	2	11					3	
Georgia	20	7	10	2					3	15	5
Florida	8	25	21				1			8	
EAST SOUTH CENTRAL											
Kentucky	38	12	55				1		3		
Tennessee	9	29	32						2		
Alabama	58	22	22							13	1
Mississippi [2]									1	3	1
WEST SOUTH CENTRAL											
Arkansas	3	7	17	2					4	2	1
Louisiana		2	2						3	7	
Oklahoma	4	11	8	1							
Texas	125	174	174	11	378	91	1			22	15
MOUNTAIN											
Montana	1	17	9								
Idaho	21		2								1
Wyoming		6	8								
Colorado	27	35	28								1
New Mexico	4	3	7								1
Arizona	4	9	19	1		38	2				3
Utah [2]	3	5	24								
Nevada	2										
PACIFIC											
Washington	28	33	45								1
Oregon	10	10	10	1							1
California	123	192	192	1	6		1				3
Total	2,155	2,263	3,864	31	405	162	8	0	32	75	69
Same week, 1945	2,263			38	618	160	8	0	43	84	69
Average, 1943–45	2,703			32	365	93	11	[4] 0	23	[4] 58	
2 weeks: 1946	3,528			68	855	263	13	0	52	142	116
1945	4,108			47	1,572	474	13	0	82	169	124
Average, 1943–45	5,047		[4] 7,728	47	827	224	17	[4] 0	56	[4] 121	

[2] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

Anthrax: New Jersey 1. *Dengue:* Oregon 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 5, 1946

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	-------	0	4	0	4	0	0	9
New Hampshire:												
Concord	0	0	------	0	-------	0	3	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	-------	0	0	0	0	0	0	------
Massachusetts:												
Boston	1	0	------	0	13	0	17	0	29	0	0	31
Fall River	0	0	------	0	-------	0	0	0	3	0	0	2
Springfield	0	0	------	0	1	0	1	0	9	0	0	1
Worcester	0	0	------	0	19	0	10	0	7	0	0	1
Rhode Island:												
Providence	0	0	2	1	-------	0	2	0	4	0	0	18
Connecticut:												
Bridgeport	0	0	2	0	1	1	5	0	0	0	1	------
New Haven	0	0	7	1	2	0	4	0	0	0	0	1
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	12	1	-------	0	5	0	3	0	0	32
New York	8	0	78	7	72	5	170	3	76	0	1	51
Rochester	0	0	------	0	2	0	7	0	15	0	1	3
Syracuse	0	0	------	0	296	0	3	0	7	0	0	7
New Jersey:												
Camden	2	0	------	1	-------	0	1	0	1	0	0	4
Newark	0	0	15	4	4	2	7	0	8	0	0	30
Trenton	0	0	5	1	-------	0	8	0	0	0	0	------
Pennsylvania:												
Philadelphia	2	0	23	5	140	3	37	0	32	0	0	30
Pittsburgh	1	0	3	4	-------	1	14	1	11	0	0	4
Reading	0	0	1	3	-------	0	4	0	1	0	0	8
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	6	5	-------	1	15	0	5	0	0	7
Cleveland	3	0	11	2	4	5	18	0	12	0	0	19
Columbus	1	0	3	3	-------	0	8	0	15	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	-------	0	8	0	0	0	0	------
Indianapolis	1	0	------	0	20	0	12	0	5	0	0	6
South Bend	0	0	------	0	-------	0	0	0	1	0	0	------
Terre Haute	0	0	------	0	-------	0	2	0	1	0	0	------
Illinois:												
Chicago	0	0	11	6	322	10	62	0	37	0	1	22
Springfield	0	0	------	0	-------	0	3	0	2	0	0	------
Michigan:												
Detroit	3	0	18	5	129	2	27	0	14	0	0	38
Flint	0	0	------	0	32	0	6	0	8	0	0	------
Grand Rapids	1	1	8	3	4	0	3	0	5	0	0	7
Wisconsin:												
Kenosha	0	0	------	0	-------	0	0	0	0	0	0	------
Milwaukee	0	0	4	4	9	0	14	1	24	0	0	10
Racine	0	0	------	0	-------	0	0	0	3	0	0	7
Superior	0	0	------	1	-------	0	2	0	0	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	-------	0	2	0	0	0	0	2
Minneapolis	1	0	------	0	-------	0	3	0	4	0	0	1
Missouri:												
Kansas City	2	0	7	3	59	1	14	0	6	0	0	1
St. Joseph	0	0	------	0	37	0	0	0	4	0	0	------
St. Louis	0	0	12	6	13	2	21	0	3	0	0	2

City reports for week ended Januury 5, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0		1		0	6	0	5	0	0	
Kansas:												
Topeka	0	0		0	8	0	0	0	4	0	0	2
Wichita	0	0		0		0	12	0	9	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0		0	2	1	4	0	0	0	0	
Maryland:												
Baltimore	8	0	52	3	8	3	25	0	14	0	0	19
Cumberland	0	0	1	0		0	0	0	0	0	0	
Frederick	0	0		0		0	2	0	0	0	0	
District of Columbia:												
Washington	0	0	9	2		2	8	0	3	0	2	10
Virginia:												
Lynchburg	2	0	46	0		0	0	0	0	0	0	
Richmond	0	0	3	3	1	0	3	0	7	0	1	2
Roanoke	0	0		0		0	0	0	1	0	0	
West Virginia:												
Charleston	0	0		0		0	0	0	3	0	0	
Wheeling	0	0		0		1	2	0	1	0	0	1
North Carolina:												
Raleigh	0	0		0		0	4	0	0	0	0	
Winston-Salem	1	0		0	2	1	6	0	4	0	0	8
South Carolina:												
Charleston	0	0	183	3		0	1	0	1	0	0	
Georgia:												
Atlanta	0	0	85	0		0	0	0	3	0	0	
Brunswick	0	0		0		0	0	0	0	0	0	
Savannah	1	0	34	3		0	2	0	2	0	0	
Florida:												
Tampa	2	0		0	6	2	1	0	1	0	0	
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	7	5	4	0	22	0	6	0	0	4
Nashville	0	0		2	7	0	6	0	4	0	0	1
Alabama:												
Birmingham	3	0	117	0	7	1	11	0	5	0	0	1
Mobile	1	0	15	4		1	1	0	0	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	93	1	1	0	1	0	1	0	0	1
Louisiana:												
New Orleans	8	0	15	3		0	[1] 18	[1] 1	6	0	0	1
Shreveport	0	0		4		0	0	0	0	0	1	
Texas:												
Dallas	3	0	4	0		1	3	0	4	0	0	1
Galveston	0	0		1		0	1	0	1	0	0	
Houston	1	0		1	2	1	7	1	5	0	1	
San Antonio	2	0	8	5	3	0	7	0	0	0	0	1
MOUNTAIN												
Montana:												
Great Falls	0	0		2		0	0	0	0	0	0	
Helena	0	0		0		0	0	0	0	0	0	
Missoula	0	0	50	0		0	1	1	2	0	0	
Idaho:												
Boise	0	0		0	3	0	0	0	0	0	0	
Colorado:												
Denver	1	0	14	4	7	4	12	0	6	0	0	8
Pueblo	0	0		0	1	0	0	0	7	0	0	9
Utah:												
Salt Lake City	0	0		0	4	0	1	0	8	0	0	

[1] Corrected report, week ended Dec. 1, 1945: New Orleans pneumonia deaths 2 instead of 0; poliomyelitis cases 6 instead of 8.

City reports for week ended January 5, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	1	61	0	3	0	7	0	0	5
Spokane	0	0	------	0	17	0	3	0	5	0	0	2
Tacoma	0	0	------	1	53	0	1	0	0	0	0	22
California:												
Los Angeles	4	0	190	5	25	3	8	1	42	0	0	7
Sacramento	1	0	------	0	16	0	5	0	1	0	0	14
San Francisco	0	0	17	0	92	2	9	0	10	0	0	6
Total	68	1	1,171	120	1,509	56	718	9	538	0	9	483
Corresponding week, 1945	75	------	125	44	219	------	488	------	1,112	0	4	463
Average, 1941-45	70	------	2,680	[2] 132	[3] 1,996	------	[2] 687	------	1,052	2	13	813

[2] 3-year average, 1943-45.
[3] 5-year median, 1941-45.

Anthrax.—Cases: Camden 1.
Dysentery, amebic.—Cases: New York 2; Detroit 3.
Dysentery, bacillary.—Cases: New York 2; Detroit 8; San Antonio 5; Los Angeles 2.
Dysentery, unspecified.—Cases: Baltimore 3; San Antonio 15.
Tularemia.—Cases: Nashville 1.
Typhus fever, endemic.—Cases: New York 1; Atlanta 3; Tampa 1; Birmingham 2; New Orleans 2; Shreveport 2.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1943, 33,842,300)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	2.9	0.0	31.5	5.7	103	2.9	131.7	0.0	163	0.0	2.9	180
Middle Atlantic	7.4	0.0	63.4	12.0	238	5.1	118.5	1.9	71	0.0	0.9	78
East North Central	6.1	0.6	37.1	17.6	316	10.9	109.5	0.6	80	0.0	0.6	72
West North Central	6.8	0.0	42.8	22.5	264	6.8	130.7	0.0	79	0.0	0.0	23
South Atlantic	23.2	0.0	685.5	23.2	32	16.6	96.3	0.0	66	0.0	5.0	66
East South Central	23.6	0.0	820.4	64.9	106	11.8	236.1	0.0	89	0.0	0.0	35
West South Central	40.2	0.0	344.3	43.0	17	5.7	106.2	5.7	49	0.0	5.7	11
Mountain	8.2	0.0	525.3	49.2	123	32.8	114.9	8.2	189	0.0	0.0	140
Pacific	7.9	0.0	327.4	11.1	418	7.9	45.9	1.6	103	0.0	0.0	89
Total	10.5	0.2	180.9	18.5	233	8.7	110.9	1.4	83	0.0	1.4	75

TERRITORIES AND POSSESSIONS

Panama Canal Zone

Notifiable diseases—November 1945.—During the month of November 1945, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	3				2				5	
Diphtheria	7		1				1		9	
Dysentery, amebic	1				1		4		6	
Malaria [1]	7		2		54		80	2	143	2
Measles					1		2		3	
Paratyphoid fever	1								1	
Pneumonia		5		1	51	1		4	[2] 51	11
Tuberculosis		20		5	3			4	[2] 3	29
Whooping cough					3				[2] 3	

[1] 19 recurrent cases.
[2] Reported in the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 15, 1945.—During the week ended December 15, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		9		267	264	41	87	65	131	864
Diphtheria		6	4	40		4	2	3	6	65
Dysentery, bacillary				1						1
German measles				4	13		2	2	6	27
Influenza		10			29				2	41
Measles			4	334	400	2	8	28	74	850
Meningitis, meningococcus								1	1	2
Mumps				69	81	22	20	82	34	308
Poliomyelitis		1								1
Scarlet fever		13	14	78	61	21	8	28	25	248
Tuberculosis (all forms)		10	20	138	44	11		36		259
Typhoid and paratyphoid fever				18	1				2	21
Undulant fever					3					3
Venereal diseases:										
Gonorrhea	2	11	11	91	180	71	29	45		440
Syphilis	1	9	4	114	160	21	14	16		339
Whooping cough		1		159	21	5		9	2	197

JAMAICA

Notifiable diseases—4 weeks ended December 15, 1945.—During the 4 weeks ended December 15, 1945, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	3	2	Puerperal fever		1
Diphtheria	6	6	Scarlet fever	2	2
Dysentery, unspecified	7	12	Tuberculosis, pulmonary	22	61
Erysipelas	1	5	Typhoid fever	18	142
Leprosy		3	Typhus fever	4	

NORWAY

Notifiable diseases—September 1945.—During the month of September 1945, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	10	Mumps	52
Diphtheria	911	Paratyphoid fever	7
Dysentery, unspecified	35	Pneumonia (all forms)	1,015
Encephalitis, epidemic	2	Poliomyelitis	162
Erysipelas	535	Rheumatism	147
Gastroenteritis	6,909	Scabies	6,575
Gonorrhea	629	Scarlet fever	404
Hepatitis, epidemic	1,157	Syphilis	92
Impetigo contagiosa	5,807	Tuberculosis (all forms)	258
Influenza	1,621	Typhoid fever	2
Laryngitis	7,754	Weil's disease	10
Lymphogranuloma inguinale	1	Whooping cough	2,915
Measles	3,907		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Peru.—For the month of November 1945, plague was reported in Peru as follows: Huamani Farm, Ica Department, 1 case; Chicaca Farm, Huacho, Lima Department, 1 case, 1 death; Siclamache Farm, Huancabamba Province, Piura Department, 1 case; Tumbes city, 19 cases, 3 deaths.

Smallpox

Belgian Congo.—For the week ended December 15, 1945, 88 cases of smallpox (alastrim) were reported in Belgian Congo.

Morocco (French).—For the period December 21–31, 1945, 154 cases of smallpox were reported in French Morocco, including regions as follows: Agadir and frontier districts, 17; Casablanca, 42; Fez, 18; Marrakech, 40; Meknes, 9; Oujda, 15; Rabat, 13.

Typhus Fever

Belgian Congo.—For the week ended December 15, 1945, 83 cases of typhus fever were reported in Belgian Congo, including 7 cases in Leopoldville Province and 76 cases in Usumbura Province.

Egypt.—Typhus fever has been reported in Egypt as follows: Week ended December 8, 1945, 39 cases; week ended December 15, 1945, 53 cases.

Morocco (French).—For the period December 21–31, 1945, 161 cases of typhus fever were reported in French Morocco including regions as follows: Agadir and frontier districts, 2; Casablanca, 66; Fez, 9; Marrakech, 6; Meknes, 54; Rabat, 4.

Rumania.—A report dated January 8, 1946, stated that about 250 cases of typhus fever have been occurring weekly throughout Rumania.

Turkey.—For the week ended January 5, 1946, 44 cases of typhus fever were reported in Turkey, including the ports of Antalya, 1; Balikesir, 5; Istanbul, 11; Izmir, 6; Kocaeli, 3; Zonguldak, 1.

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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Public Health Reports

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INFLUENCE OF pH AND TEMPERATURE ON THE SURVIVAL OF COLIFORMS AND ENTERIC PATHOGENS WHEN EXPOSED TO CHLORAMINE [1]

By C. T. BUTTERFIELD, *Principal Bacteriologist*, and ELSIE WATTIE, *Bacteriologist*
United States Public Health Service

In a preceding paper of this series (*1*), data were presented on the influence of pH and temperature on the survival of coliforms and enteric pathogens when exposed to free chlorine. In that paper it was pointed out that very little information was available concerning the bactericidal properties of free chlorine, to the exclusion of all chlorine-addition products. It also was emphasized that (*a*) the bacterial kills were obtained with free chlorine to the exclusion of all chlorine-addition products; (*b*) free chlorine was a much more effective bactericidal agent than any equivalent amount of chloramine or any combination of chlorine and chloramine, and (*c*) consequently the results presented were applicable as a criterion in estimating the bactericidal efficiency of water disinfection by chlorine, only when the chlorine was present as free chlorine. That is, the results are applicable only when the water under treatment is free of substances which would combine with chlorine to form chlorine-addition products, or when the chlorine being measured is post-break-point chlorine in the break-point chlorination process. It was indicated also that little information was available concerning the action of chloramine in the absence of free chlorine.

Since the studies reported at this time were completed, Weber and Levine (*2*) have reported on factors affecting the germicidal efficiency of chlorine and chloramine, using a standardized suspension of spores

[1] From Sanitary Engineering Division, Water and Sanitation Investigations, East Third and Kilgour, Cincinnati 2, Ohio.

of *B. metiens* as test organisms. They consider the results obtained with spores applicable to vegetative cells of bacteria such as the coliforms and enteric pathogens. They conclude in part that in disinfection with free chlorine there is a decided lag at first, followed by increasing death rates; whereas with chloramine, death rates, in general, were quite constant throughout the period of disinfection. They also state that in reactions more alkaline than pH 9.4 chloramine is a better disinfectant than free chlorine.

Results obtained with vegetative cells, which will be herein presented, are not in complete agreement with these observations. This probably means that there are definite differences in the effects obtained with vegetative cells and with spores.

Weber and Levine conclude further that with Cl_2:N ratios of 4:1 or less the chlorine available was but slightly altered and was all chloramine; whereas with Cl_2:N ratios of 8:1 or more, chlorine residuals were reduced and the available chlorine was present as free chlorine. That is, they suggest that (*a*) the hump of the break point curve comes at a Cl_2:N ratio of about 4:1; (*b*) the break point of the curve is at a Cl_2:N ratio of about 8:1; and (*c*) free chlorine is present with Cl_2:N ratios between 4:1 and 8:1.

Moore, Megregian, and Ruchhoft (*3*), reporting on the chemical aspects of the ammonia-chlorine treatment of water, have shown that in a system freed of all oxidizable organic matter, the hump in the break point curve occurs at a Cl_2:N ratio of about 5:1 and the break point at a ratio of about 9:1. They also have shown that both the Marks titrator test and the p-aminodimethylaniline flash test indicated no free chlorine present up to the time of break point and no chloramine-chlorine beyond the break point. The concensus appears to favor these observations, though considerable disagreement exists regarding these matters, with the literature appearing to indicate that break point may occur at Cl_2:N ratios of from 5:1 to 25:1. For more complete information regarding this and other related factors, the reader should review the literature cited in references (*1*), (*2*), and (*3*).

In the studies reported at this time the bactericidal efficiency of the chloramines for the coliforms and some of the enteric pathogens has been determined under various conditions, to the exclusion of free chlorine or any other toxic agent. To assure such conditions, tests were conducted with Cl_2:N ratios of 6:1 or less, with a contact period of 1 hour for the Cl_2 and ammonium chloride solution added, before the test organisms were introduced. Examinations made during the study indicated that at this and lesser ratios, oxidation of ammonia did not occur, and the residual chlorine content (in the absence of other substances with a chlorine demand) was approximately the same as the amount of chlorine added, and was all chloramine. With

ratios of Cl_2:N of 6:1 or more, oxidation of the chloramines formed began and was carried to completion (break point) at ratios of about 9:1 to 10:1. During this period of oxidation the residual chlorine content, present as chloramine, is reduced in proportion to the amount of N oxidized until a zero residual chlorine reading is obtained at break point, when all of the N present has been oxidized. Any residual chlorine found post-break point is free chlorine or hypochlorite. These observations would be equally applicable to water disinfection processes using chlorine regardless of whether N was present in the water from natural or pollutional sources, or had been added as an ammonium compound in connection with the chlorine-ammonia process. The results presented at this time on the bactericidal efficiency of chloramines should be of especial interest wherever water disinfection by the chlorine-ammonia process is used or such use is contemplated.

METHODS

In general, the methods followed in this study were the same as in the previous investigation of the bactericidal properties of free chlorine, and reference is made to that report (*1*) for their description. This applies particularly to the preparation of (*a*) chlorine-free, chlorine-demand-free water, buffered at the desired pH ranges; (*b*) glassware; (*c*) stock chlorine solutions; (*d*) bacterial suspensions; (*e*) the determination of the hydrogen-ion concentration; (*f*) the making of bacterial counts and the identification of survivor bacteria; and (*g*) the neutralization of the residual chloramine in sample portions withdrawn for test. In working with chloramines certain additional methods necessarily were required. These may be described as follows:

Preparation of stock nitrogen solution.—A standardized solution of ammonium chloride (0.5728 gm. of NH_4Cl per liter) was prepared for these tests. This strength of solution was selected to facilitate the preparation for each test. That is, the major portion of the tests was made with a concentration of nitrogen as N of 0.3 p. p. m., and the standard amount of water used in these tests was 500 ml. One milliliter of this standardized ammonium chloride solution added to 500 ml. of chlorine-free, chlorine-demand-free water produced a N content of 0.3 p. p. m.

Determination of chloramine residual.—The methods given in reference (*1*) for the preparation of chlorine solutions and the determination of chlorine residuals were used in this study. However, certain additional factors should be noted. The minimum effective amount of residual chlorine as chloramine was 0.15 p. p. m. whereas in the study with free chlorine, residuals of 0.03 p. p. m. or less were found to be bactericidal. Thus the minimum residuals of chloramine, being of greater magnitude, could be determined more accurately.

Check tests for the presence of free chlorine were made with the p-aminodimethylaniline indicator described by Moore (*4*) but free chlorine indications with this flash test were never observed in this study at Cl_2:N ratios below 9:1. Tests for residual chlorine as chloramine were made with orthotolidine, using 2.0 ml. of reagent per 100 ml. of sample with the temperature adjusted to between 20° and 25° C. when such adjustment was needed. Readings were made after 10 to 30 seconds and again after standing for 10 minutes; the former to check on the flash test for free chlorine and the latter to determine the total residual present. The appearance of color in 30 seconds would have been considered definite evidence of the presence of free chlorine, and preliminary tests had proved that full color development from chloramine would take place in 10 minutes at 20° C.

It is realized in making these tests and in basing this report on these methods that the residual chlorine results recorded are not in themselves a direct measure of the effective bactericidal agent, active in the waters tested. That is, it is recognized that the bactericidal action is a function of (*a*) the available concentration of the toxic agent; (*b*) the period of exposure; and (*c*) the temperature. In the waters used in this study, which had been freed of all chlorine-utilizing or -combining substances, the available concentration of the active bactericidal agent depended entirely on the extent to which the total toxic agent present could release the active agent; or, the extent to which the chloramine present could provide ionized chlorine or hypochlorite under the existing conditions. It has been estimated that at pH readings of 5.0, 6.0, 7.0, 8.0, 9.0, and 10.0 the amount of ionized hypochlorite is 100, 97, 75, 23, 3.0, and 0.3 percent, respectively, and that at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 the chloramine present as monochloramine is 35, 51, 84, 98, 100, and 100 percent, respectively. In each case the remaining chloramine is probably dichloramine. Thus, the hydrogen-ion concentration of the water appears to be the most important factor in determining the availability of the bactericidal agent. In the results reported at this time with the residual chlorine based on the total titratable chlorine, or the residual indicated by orthotolidine after 10 minutes at 20° C., no measure was made of the active bactericidal agent. If this had been done, it is logical to assume that equivalent amounts of active, available bactericide would produce equal bacterial kills regardless of the pH of the water. However, it seemed advisable to report the results based on these methods as in practically all cases tests made for chloramines in actual plant operation will depend entirely on such procedures. To attempt to estimate the active chlorine available from chloramine would only cloud the issue, when practical tests for such determinations are not available for routine plant operation.

Preparation of bacterial suspensions.—For this chloramine study, bacterial suspensions were prepared in the manner described in the free chlorine study (*1*) from the 11 strains of the 5 genera used in that study. Ten additional strains of the genus *Shigella*, freshly isolated or virulent cultures, were available for test in the chloramine study. These were composed of 1 strain of dysenteriae, 4 strains of sonnei and 5 strains of paradysenteriae, the latter including 1 Flexner V, 1 Flexner W, 2 Flexner Z, and 1 Boyd 88. These additional *Shigella* cultures were available through the courtesy of Maj. K. S. Wilcox of the United States Army Medical School.

TEST PROCEDURES

Using the methods, equipment, and materials above described, 193 series of tests have been performed in addition to a considerable number of preliminary exploratory experiments. The complete program of the study occupied a period of about 2 years. A series consisted of repeated observations on a number of test portions of water. The number of test portions in a series was varied in a few instances, but in general eight was the number used. Of these, one was a control, containing the buffered water with N added, and the other seven were test portions with increasing amounts of chloramine present. The set-up of a standard series may be described as follows:

Ten milliliters of standardized stock ammonium-chloride solution were added to 5 liters of sterile, chlorine-free, chlorine-demand-free water which had been prepared as described and buffered at the desired pH. (This provided a nitrogen content, as N, of 0.3 p. p. m. In a few series, 18, the Cl_2 content was kept constant with the N content varied to determine the effect of such variations.) The contents were mixed thoroughly and 500-ml. portions of this mixture were transferred to each of eight sterile, chemically clean, 1-liter Erlenmeyer flasks, numbered from 1 to 8. Flask No. 1 was a control, which received no chlorine and was equipped with a thermometer to provide for temperature readings. The remaining seven flasks received increasing amounts of standardized chlorine solution (titrated by acid starch-iodide procedure), at appropriate intervals, to produce concentrations of 0.15, 0.3, 0.6, 0.9, 1.2, 1.5, and 1.8 p. p. m., respectively. This produced Cl_2:N ratios of 0.00, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, and 6.0 to 1.0, respectively in the eight flasks. The term "appropriate interval" means that additions of chlorine to each succeeding flask were made with such intervening time periods that conflicts would not occur in the times for subsequent examinations of the various test portions. In preliminary series various periods of contact (from a few minutes to 68 hours) of the nitrogen and chlorine before the addition of the test bacteria were tried. It was found, as has been reported by Moore et al (*3*), that the chlorine-ammonia

reaction was quite rapid, particularly in the lower pH ranges, and was complete in all cases before 1 hour had elapsed. A contact period of 1 hour, therefore, was made the standard for the routine series of this study.

At the end of the 1-hour contact period a 100-ml. portion of the 500 ml. in each flask was removed for a residual chlorine determination, the temperature was read and recorded, and 1 ml. of a suspension of the test bacteria was added. Vigorous mixing was started at once and continued for 1 minute before a portion was withdrawn for plating. Preliminary tests had indicated that uniform distribution was obtained under the given conditions in 15 to 30 seconds, and the period of 1 minute (approximately twice the time indicated for uniform mixing) was adopted so that this initial period could be observed exactly for all test portions in all series. Examinations for survivor bacteria were made uniformly at the 1.0-, 3.0-, 5.0-, 10.0-, 20.0-, 40.0-, 60.0-, 90.0-, 120-, 180-, and 240-minute periods of exposure. Occasionally, as indicated, examinations were made also at the 6- and 24-hour periods. Likewise, examinations were discontinued when previous tests showed that 100-percent kills had been obtained for at least two of the preceding test periods. Hydrogen-ion concentrations were also checked at the start and at the close of each run.

Examinations for residual chlorine in each flask of a series were made at the start, after 1 hour, and again at the end of each run. Initial chlorine residuals only are shown in the tables presented, as variations in chloramine residuals observed at later periods were never in excess of the observational error. In fact, a detailed study of the persistence of chloramine residuals under the conditions of this study showed reductions in residuals were not to be anticipated during the first 24 hours. A time schedule was prepared for each flask to provide for accuracy in observing the correct times for sampling and examination. Series were run at 2° to 6° C., and at 20° to 25° C., and with waters at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5, with the greatest number at pH 8.5, being representative of an average water. For all series conducted at 2° to 6° C., and also at 20° to 25° C., when room temperatures were not within this range, the flasks were kept in a constant-temperature water bath. The temperature ranges given represent the average minimum and maximum temperatures observed during the entire course of a series; actually the average ranges of temperature observed during the more important period of each series (first 2 hours), were 2° to 4° C. and 20° to 22° C.

RESULTS

In performing these 193 series of tests, the range of observations was extended to the limits which it was thought might be met under natural conditions in practical water-treatment operations. The

accomplishment of two objects was sought in this: To obtain data which, even though limited, might be useful as a general guide in controlling water-disinfection processes; and to provide data for a direct comparison of the relative efficiency of water disinfection under the various conditions of the tests by the use of (*a*) chloramine and (*b*) free chlorine, utilizing for the latter the data presented in the previous report (*1*). Thus, with regard to hydrogen-ion concentration, series were run at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5, the maximum range which would be expected in nature under average conditions. With regard to temperature, two ranges, 2° to 6° C. and 20° to 25° C., the average extremes to be expected in nature, were studied.

Of the 193 series (*a*) 32 were performed at the 2° to 6° C. temperature range; of these, 12 were with *Escherichia coli* and 12 with *Eberthella typhosa* in waters of pH 7.0, 8.5, and 9.5, and 8 with *Shigella sonnei* in waters at pH 8.5; (*b*) 143 were performed at 20° to 25° C., 26 with *Esch. coli* strains, 24 with *Aerobacter aerogenes*, 25 with *Pseudomonas pyocyanea*, 24 with *Eber. typhosa*, and 24 with *S. dysenteriae*, each in waters of all the pH values noted; and 8 series were carried on with *S. sonnei* and 12 series with *S. dysenteriae* in waters at pH 8.5 only; and (*c*) also at 20° to 25° C., 18 series conducted with *Esch. coli* in waters of pH 7.0, 8.5, and 10.5 with the Cl_2 content kept constant at 0.3 p.p.m. and the N content varied so that Cl_2:N ratios ranging from 1:1 to 1:25 were obtained.

As has been noted, every series with each strain under test was repeated at least once and the results averaged. Then the averaged results for all strains of a given genus, obtained under the same conditions, were averaged to obtain the data presented in the tables. The number of cultures used of each genus and the total number of series represented in each averaged result are shown in the tables. The average results obtained with *Esch. coli, A. aerogenes, P. pyocyanea Eber. typhosa*, and *S. dysenteriae* are presented in tables 1 to 5, respectively. In table 6 the results obtained with various strains of *S. dysenteriae, S. sonnei*, and *S. paradysenteriae* at 20° to 25° C. are compared, and in table 7 the results obtained with *S. sonnei* in waters of pH 8.5 at 2° to 6° C. are shown. Table 8 contains the results obtained in waters at pH 7.0, 8.5, and 10.5, at 20° to 25° C., with *Esch. coli* when the Cl_2 content was kept constant and the N content varied, so that Cl_2:N ratios of from 1:1 to 1:25 existed. These data of table 8 may be compared with those of table 1 where Cl_2:N ratios of 0.5:1 to 6:1 prevailed. In table 9 data are compiled from tables 1 to 7, inclusive, to show the average time in minutes required to produce a 100-percent kill of the bacteria of the various genera under the various conditions of test.

TABLE 1.—*Average survival of* Escherichia coli, *expressed in percent of initial number, when exposed to chloramine in various concentrations at pH 7.0, 8.5, and 9.5 at 2° to 6° C., and at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5, at 20° to 25° C., with nitrogen content constant (0.3 p. p. m.) and contact time of Cl_2 and N, 1 hour before addition of bacteria.*

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
						At 2° to 6° C.								
						pH 7.0								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	92.4	-----	88.4	0	0-1
2	4	94.4	-----	-----	93.0	81.5	70.7	67.7	60.0	48.8	31.1	21.0	.15	0.5-1
2	4	97.2	-----	-----	85.3	74.0	61.0	57.3	34.6	16.1	4.3	.8	.30	1-1
2	4	92.8	-----	-----	76.2	67.7	36.1	17.5	2.8	.5	0	0	.60	2-1
2	4	95.2	-----	-----	64.0	47.0	13.7	2.2	.1	0	0	-----	.90	3-1
2	4	96.0	-----	74.9	49.2	21.8	2.0	.1	0	0	-----	-----	1.20	4-1
2	4	92.4	-----	62.9	43.6	13.4	.7	0	0	0	-----	-----	1.50	5-1
2	4	88.6	65.7	44.4	9.8	0.1	0	0	-----	-----	-----	-----	1.80	6-1
						pH 8.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	90.8	0.02	0-1
2	4	100.0	-----	-----	[1] 99.7	-----	-----	99.0	-----	82.7	-----	76.4(1)	.15	0.5-1
2	4	97.0	-----	-----	94.8	-----	-----	90.0	81.7	75.9	58.6	41.8(2)	.30	1-1
2	4	96.1	-----	-----	95.5	-----	-----	85.2	70.6	58.7	40.1	26.4(3)	.60	2-1
2	4	94.6	-----	-----	88.9	-----	-----	66.8	52.4	39.0	20.7	14.6(4)	.90	3-1
2	4	93.8	-----	-----	92.0	80.0	74.8	54.8	40.9	22.1	4.5	1.3(5)	1.20	4-1
2	4	94.4	-----	-----	88.4	78.8	57.1	43.4	35.4	9.8	2.8	1.0(6)	1.50	5-1
2	4	82.4	44.8	20.8	.2	0	0	0	-----	-----	-----	-----	1.80	6-1
						pH 9.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	86.5	0	0-
2	4	94.4	-----	-----	91.8	-----	-----	84.2	-----	85.0	83.5	72.0(7)	.30	1-
2	4	98.6	-----	-----	93.5	-----	-----	88.3	-----	80.4	67.5	68.5(8)	.60	2-
2	4	96.6	-----	-----	91.8	-----	-----	83.1	-----	76.0	65.7	61.3(9)	.90	3-
2	4	95.1	-----	-----	90.2	-----	-----	75.6	-----	68.0	62.9	52.0(10)	1.20	4-
2	4	94.0	-----	-----	84.2	-----	-----	73.0	-----	64.3	49.9	23.4(11)	1.50	5-
2	4	86.2	-----	67.0	54.9	13.5	13.8	2.6	0	0	-----	-----	1.80	6-

[1] Interpolated figure.

NOTE.—Percentages surviving at the sixth and twenty-fourth hours were respectively: (1) 67.1 and 5.0; (2) 35.1 and 0.1; (3) 0.2 and 0; (4), (5), and (6), 0 and 0; (7) 61.5 and 48.1; (8) 66.5 and 4.4; (9) 56.0 and 0; (10) 33.2 and 0; and (11) 7.4 and 0 percent.

Number of strains	Number of tests	1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
						At 20° to 25° C.								
						pH 6.5								
2	5	100.0	-----	-----	-----	-----	-----	91.3	-----	98.3	-----	93.7	0.01	0-1
2	5	88.6	-----	-----	77.2	54.4	15.6	.5	-----	-----	-----	-----	.15	5-1
2	5	94.1	-----	[1]79.3	60.8	27.2	.2	0	0	0	-----	-----	.30	1-1
2	5	81.7	88.5	49.0	20.7	.1	0	0	-----	-----	-----	-----	.60	2-1
2	5	72.5	57.5	36.8	2.4	0	0	0	-----	-----	-----	-----	.90	3.1
2	5	67.5	47.7	22.2	.8	0	0	-----	-----	-----	-----	-----	1.20	4-1
2	5	56.2	17.2	.9	0	0	0	-----	-----	-----	-----	-----	1.50	5-1
2	3	60.5	.1	0	0	0	0	0	-----	-----	-----	-----	1.80	6-1
2	3	59.2	0	0	0	0	0	-----	-----	-----	-----	-----	1.80	7-1
2	3	15.0	0	0	0	0	0	-----	-----	-----	-----	-----	1.40	8-1
2	3	0	0	0	0	0	0	-----	-----	-----	-----	-----	1.10	9-1
2	3	0	0	0	0	0	0	-----	-----	-----	-----	-----	.50	10-1

TABLE 1.—*Average survival of* Escherichia coli, *expressed in percent of initial number, when exposed to chloramine in various concentrations at pH 7.0, 8.5, and 9.5, at 2° to 6° C., and at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5, at 20° to 25° C., with nitrogen content constant (0.3 p. p. m.) and contact time of Cl_2 and N, 1 hour before addition of bacteria*—Continued

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
At 20° to 25° C—Continued														
pH 7.0														
2	4	100.0	-----	-----	-----	97.6	100.0	100.0	-----	86.6	100.0	77.4	0.01	0-1
1	2	97.3	-----	76.6	82.6	69.8	54.4	25.2	-----	.1	-----	-----	.15	.5-1
2	4	99.0	-----	81.7	76.4	59.6	4.4	.1	0	0	-----	-----	.30	1-1
2	4	92.4	-----	72.8	60.2	4.2	0	0	0	0	-----	-----	.60	2-1
2	4	96.2	85.9	58.2	23.5	.4	0	0	0	-----	-----	-----	.90	3-1
2	4	78.4	61.0	41.2	3.2	0	0	0	-----	-----	-----	-----	1.20	4-1
2	4	72.1	52.5	17.8	.2	0	0	0	-----	-----	-----	-----	1.50	5-1
1	2	86.6	15.4	0	0	0	0	0	-----	-----	-----	-----	1.80	6-1
1	2	86.4	.5	0	0	0	0	0	-----	-----	-----	-----	1.10	7-1
1	2	5.6	0	0	0	0	0	0	-----	-----	-----	-----	1.10	8-1
1	2	0	0	0	0	0	0	0	-----	-----	-----	-----	.40	9-1
1	2	0	0	0	0	0	0	0	-----	-----	-----	-----	.50	10-1
pH 7.8														
2	2	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	100.0	0	0-1
2	2	100.0	-----	-----	87.0	81.8	39.8	8.7	1.3	0.3	0	0	.30	1-1
2	2	98.8	-----	81.7	79.3	35.0	1.4	.1	0	0	0	0	.60	2-1
2	2	91.1	-----	74.0	55.8	2.3	.1	0	0	0	-----	-----	.90	3-1
2	2	81.8	-----	59.7	19.6	.1	.0	0	0	-----	-----	-----	1.20	4-1
2	2	76.0	67.9	-----	3.8	0	0	0	-----	-----	-----	-----	1.50	5-1
2	2	67.4	-----	36.6	6.0	0	0	0	-----	-----	-----	-----	1.80	6-1
pH 8.5														
2	5	100.0	-----	-----	-----	-----	-----	98.8	-----	100.0	-----	93.7	0.01	0-1
2	3	100.0	95.3	[1]98.5	-----	-----	92.5	94.2	83.4	67.5	28.8	6.5	.15	5-1
2	5	99.1	[1]98.3	[1]97.0	93.6	[1]90.5	78.9	62.9	32.0	14.6	4.1	.1	.30	1-1
2	5	97.9	[1]93.0	[1]89.1	79.7	72.9	42.4	12.8	1.8	0	0	0	.60	2-1
2	5	95.3	80.7	75.0	75.1	61.0	22.7	1.6	0	0	0	-----	.90	3-1
2	5	89.7	75.8	74.0	63.6	30.5	1.4	0	0	0	-----	-----	1.20	4-1
2	5	87.1	77.1	65.7	46.9	9.0	0	0	0	-----	-----	-----	1.50	5-1
2	3	43.1	19.1	10.1	.1	0	0	0	-----	-----	-----	-----	1.80	6-1
2	2	0	0	0	0	0	0	0	-----	-----	-----	-----	1.30	7-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	1.30	8-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	1.20	9-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	1.20	10-1
pH 9.5														
2	5	100.0	-----	-----	-----	-----	-----	98.9	-----	97.6	-----	92.8	0.015	0-1
1	2	100.0	-----	98.1	88.2	94.0	98.6	99.2	-----	83.4	-----	17.1	.15	.5-1
2	5	99.1	-----	-----	[1]97.6	96.2	93.4	88.5	-----	59.7	24.1	6.8	.30	1-1
2	5	100.0	-----	-----	[1]96.1	92.5	82.3	52.6	21.5	4.2	.8	0	.60	2-1
2	5	95.8	-----	[1]94.5	87.1	79.1	50.3	18.0	2.2	.2	0	0	.90	3-1
2	5	97.3	94.0	84.4	73.4	55.6	18.3	1.2	0	0	-----	-----	1.20	4-1
2	5	82.3	55.1	41.9	34.4	24.4	3.8	0	0	0	-----	-----	1.50	5-1
2	3	52.9	6.9	0	0	0	0	0	-----	-----	-----	-----	1.80	6-1
1	1	1.5	0	0	0	0	0	0	-----	-----	-----	-----	2.00	7-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	2.00	8-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	2.40	9-1
1	1	0	0	0	0	0	0	0	-----	-----	-----	-----	2.40	10-1
pH 10.5														
2	5	100.0	-----	-----	-----	-----	-----	87.6	-----	74.2	67.8	74.4	0.01	0-1
1	3	96.1	-----	-----	-----	-----	-----	100.0	-----	93.7	84.2	65.6	0.15	.5-1
2	5	98.9	-----	-----	-----	-----	-----	94.7	-----	85.7	74.8	56.6	.30	1-1
2	5	97.2	-----	-----	-----	100.0	100.0	90.0	70.8	73.2	39.7	20.7	.60	2-1
2	5	98.5	-----	-----	100.0	93.5	84.7	82.0	64.7	39.0	22.8	7.3	.90	3-1
2	5	98.4	-----	96.5	92.4	91.2	77.2	63.6	24.4	30.3	5.4	.2	1.20	4-1
2	5	91.2	86.9	74.7	81.5	76.4	50.6	27.9	7.9	2.7	0	0	1.50	5-1
1	2	100.0	83.2	86.0	70.4	27.9	5.1	0	0	0	-----	-----	1.80	6-1

[1] Interpolated figures.

TABLE 2.—*Average survival of* A. aerogenes *expressed in percent of initial numbers, when exposed to chloramine in various concentrations at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 at 20°–25° C. with nitrogen content constant (0.3 p. p. m.) and contact of Cl_2 and N, 1 hour before addition of bacteria*

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
pH 6.5														
2	4	100.0	—	—	—	—	—	—	—	—	—	94.5	Trace	0-1
2	3	93.1	—	—	86.8	69.8	45.9	31.2	5.2	0.4	0	0	.15	0.5-1
2	4	96.4	—	—	69.4	38.5	4.4	.1	0	0	0	—	.30	1-1
2	4	86.4	—	73.9	39.1	5.0	0	0	0	0	—	—	.60	2-1
2	4	89.7	70.1	48.2	7.5	0.1	0	0	0	—	—	—	.90	3-1
2	4	88.2	60.8	25.6	1.0	0	0	0	—	—	—	—	1.20	4-1
2	4	74.8	28.4	3.0	0	0	0	0	—	—	—	—	1.50	5-1
2	3	61.1	1.4	0	0	0	0	0	—	—	—	—	1.80	6-1
pH 7.0														
2	4	100.0	—	—	—	—	—	—	—	—	—	99.0	0.01	0-1
1	1	100.0	—	—	91.7	75.0	61.4	49.1	24.5	8.6	1.2	0	.20	0.5-1
2	4	96.6	—	—	89.0	59.6	25.4	2.2	.1	0	0	—	.30	1-1
2	4	96.6	—	87.6	70.6	23.3	.2	0	0	0	0	—	.60	2-1
2	4	95.2	—	79.3	43.9	2.0	0	0	—	—	—	—	.90	3-1
2	4	92.7	79.6	55.8	12.6	.1	0	0	—	—	—	—	1.20	4-1
2	4	83.6	66.1	29.5	.7	0	0	0	—	—	—	—	1.50	5-1
2	3	90.9	21.5	0	0	0	0	0	—	—	—	—	1.80	6-1
pH 7.8														
2	4	100.0	—	—	—	—	—	—	—	—	—	96.8	0	0-1
2	4	95.8	—	—	91.2	75.6	57.6	44.6	34.7	13.4	1.2	.1	.30	1-1
2	4	97.0	—	88.5	82.6	67.4	39.6	15.4	.4	.2	0	—	.60	2-1
2	4	98.5	—	82.2	61.1	33.8	10.2	.5	0	0	—	—	.90	3-1
2	4	91.0	81.6	76.4	56.9	22.8	.2	0	0	—	—	—	1.20	4-1
2	4	96.4	87.2	68.8	44.7	3.4	0	0	0	—	—	—	1.50	5-1
2	4	85.7	42.0	24.4	9.9	0	0	0	—	—	—	—	1.80	6-1
pH 8.5														
2	4	100.0	—	—	—	—	—	—	—	—	—	90.0	0.01	0-1
2	4	96.0	—	—	[2] 90.0	—	72.0	52.2	21.1	7.3	0.2	0	.30	1-1
2	4	98.0	—	—	72.2	62.2	46.2	11.4	1.3	.1	—	—	.60	2-1
2	4	93.6	—	—	68.8	54.9	14.8	.9	.1	0	—	—	.90	3-1
2	4	88.0	—	74.0	62.7	46.0	3.0	.1	0	—	—	—	1.20	4-1
2	4	84.4	70.8	61.8	54.0	18.4	.2	0	0	—	—	—	1.50	5-1
2	3	62.2	.2	0	0	0	0	0	—	—	—	—	1.80	6-1
pH 9.5														
2	4	100.0	—	—	—	—	—	—	—	—	—	92.4	Trace	0-1
1	2	90.8	—	—	—	100.0	—	93.0	—	83.0	40.0	[1] 6.4	0.15	0.5-1
2	4	99.2	—	—	98.3	90.8	83.6	68.6	—	35.0	9.2	8.6	.30	1-1
2	4	96.2	—	—	87.9	78.7	58.2	46.7	22.6	12.3	3.9	.6	.60	2-1
2	4	96.1	—	93.4	80.6	66.3	48.1	26.4	—	5.0	.1	—	.90	3-1
2	4	91.4	—	81.5	80.9	62.0	37.6	20.0	—	.9	—	—	1.20	4-1
2	4	88.1	85.8	79.4	72.2	54.0	22.2	5.8	.2	—	—	—	1.50	5-1
1	2	94.2	78.6	45.0	1.0	0	0	0	0	—	—	—	1.80	6-1
pH 10.5														
2	4	100.0	—	—	—	—	—	—	—	—	—	93.4	Trace	0-1
1	1	100.0	—	—	—	—	—	98.3	—	99.8	87.9	65.3	0.15	0.5-1
2	4	97.4	—	—	99.4	—	—	94.0	89.6	82.6	74.2	62.2	.30	1-1
2	4	99.4	—	—	96.3	—	—	89.0	81.7	71.1	58.0	38.4	.60	2-1
2	4	99.3	—	—	96.8	—	83.5	69.9	56.5	41.1	26.1	15.6	.90	3-1
2	4	91.3	—	—	93.7	80.4	82.8	72.0	57.5	33.6	23.6	6.3	1.20	4-1
2	4	97.8	—	—	88.0	75.6	61.8	43.4	28.6	12.6	.8	—	1.50	5-1
2	3	91.6	77.0	77.6	39.1	2.6	0	0	0	—	—	—	1.80	6-1

[1] 0 percent at 360 minutes.
[2] Interpolated figure.

TABLE 3.—*Average survival of* Ps. pyocyaneus *expressed in percent of initial number when exposed to chloramine in various concentrations at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 at 20°–25° C. with nitrogen content constant (0.3 p.p.m.) and contact of Cl_2 and N, 1 hour before addition of bacteria.*

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
							pH 6.5							
2	4	100.0	-----	-----	-----	-----	-----	85.4	-----	89.5	78.7	78.8	Trace	0-1
2	4	94.0	-----	83.0	85.2	77.4	61.8	64.2	2.9	0	0	0	.15	0.5-1
2	4	91.8	88.6	76.2	68.9	44.3	.2	0	0	0	-----	-----	.30	1-1
2	4	89.6	69.0	73.0	37.0	.1	0	0	-----	-----	-----	-----	.60	2-1
2	4	77.5	61.0	40.9	2.9	0	0	0	-----	-----	-----	-----	.90	3-1
2	4	71.1	55.7	12.2	.1	0	0	0	-----	-----	-----	-----	1.20	4-1
2	4	52.0	39.6	4.4	0	0	0	-----	-----	-----	-----	-----	1.50	5-1
2	4	42.6	8.6	0	0	0	0	-----	-----	-----	-----	-----	1.80	6-1
							pH 7.0							
2	5	100.0	-----	-----	-----	-----	-----	100.0	-----	87.0	84.9	82.5	Trace	0-1
2	3	95.9	-----	-----	75.6	87.6	89.0	70.1	44.8	17.9	0.4	0	.15	0.5-1
2	5	93.7	-----	85.4	93.5	76.4	16.4	2.0	0	0	0	-----	.30	1-1
2	5	95.9	-----	95.6	56.2	7.4	0	0	0	-----	-----	-----	.60	2-1
2	5	92.7	91.0	76.9	11.7	0	0	0	-----	-----	-----	-----	.90	3-1
2	5	94.2	74.9	43.9	3.3	0	0	0	-----	-----	-----	-----	1.20	4-1
2	4	72.2	33.4	24.3	.1	0	0	0	-----	-----	-----	-----	1.50	5-1
2	3	74.2	17.8	1.6	0	0	0	-----	-----	-----	-----	-----	1.80	6-1
							pH 7.8							
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	93.2	Trace	0-1
2	4	95.3	-----	-----	94.6	92.3	74.8	52.6	16.1	3.2	0	0	.30	1-1
2	4	94.5	-----	86.5	69.5	41.8	7.6	.1	0	0	0	-----	.60	2-1
2	4	88.2	-----	85.1	58.4	11.2	0	0	0	-----	-----	-----	.90	3-1
2	4	92.6	82.6	63.8	28.8	.1	0	0	-----	-----	-----	-----	1.20	4-1
2	4	88.6	67.2	49.1	7.3	0	0	0	-----	-----	-----	-----	1.50	5-1
2	4	77.4	65.5	13.7	0	0	0	0	-----	-----	-----	-----	1.80	6-1
							pH 8.5							
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	86.4	-----	Trace	0-1
2	4	90.7	-----	-----	92.9	94.4	76.1	56.6	9.6	0.3	0	-----	.30	1-1
2	4	93.3	-----	-----	76.9	75.0	37.0	2.6	0	0	0	-----	.60	2-1
2	4	87.8	-----	83.9	85.4	31.0	1.5	0	0	0	0	-----	.90	3-1
2	4	84.6	-----	88.0	59.1	4.2	0	0	0	0	-----	-----	1.20	4-1
2	4	91.4	84.5	59.2	36.8	2.6	0	0	0	-----	-----	-----	1.50	5-1
2	4	64.7	48.3	30.3	16.3	2.0	0	0	-----	-----	-----	-----	1.80	6-1
							pH 9.5							
2	4	100.0	-----	-----	-----	-----	-----	86.8	-----	72.4	-----	50.7	Trace	0-1
2	4	94.7	-----	-----	90.8	94.8	82.0	72.8	40.8	19.3	0.3	0	.30	1-1
2	4	94.9	-----	-----	87.4	85.4	68.4	32.3	24.0	2.6	0	0	.60	2-1
2	4	95.6	-----	85.8	92.4	75.0	34.3	14.4	5.8	0	-----	-----	.90	3-1
2	4	87.3	83.2	78.0	71.8	50.4	20.3	5.8	.3	0	-----	-----	1.20	4-1
2	4	91.1	80.0	71.8	50.8	34.8	16.3	6.8	0	-----	-----	-----	1.50	5-1
2	4	74.7	51.3	44.1	23.5	.8	.1	0	-----	-----	-----	-----	1.80	6-1
							pH 10.5							
2	4	100.0	-----	-----	-----	-----	-----	68.6	-----	52.2	45.2	71.6	Trace	0-1
2	4	92.2	-----	-----	-----	83.6	62.1	72.2	53.8	10.6	3.3	2.4	.30	1-1
2	4	95.8	-----	-----	90.1	86.4	60.2	47.2	28.9	.3	.3	0	.60	2-1
2	4	89.8	-----	85.4	78.5	75.5	35.0	28.8	16.0	0	0	-----	.90	3-1
2	4	91.9	-----	83.4	78.6	44.2	40.0	20.8	3.0	0	0	-----	1.20	4-1
2	4	87.8	82.6	79.3	42.3	37.8	37.5	15.1	0	0	-----	-----	1.50	5-1
2	4	58.9	50.9	41.0	33.6	20.8	.2	0	0	-----	-----	-----	1.80	6-1

TABLE 4.—*Average survival of* Eberthella typhosa, *expressed in percent of initial number when exposed to chloramine in various concentrations at pH 7.0, 8.5, and 9.5 at 2° to 6° C., and at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 at 20° to 25° C., with nitrogen content constant (0.3 p.p.m.) and contact time of Cl_2 and N, 1 hour before addition of bacteria*

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
						At 2°—6° C. pH 7.0								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	95.8	0	0-1
2	4	92.7	-----	-----	93.2	86.9	78.8	71.7	61.4	44.4	17.9	10.7(1)	.15	0.5-1
2	4	92.2	-----	-----	85.4	76.3	68.9	50.6	27.3	10.0	1.8	.7	.30	1-1
2	4	90.4	-----	80.9	73.0	67.6	31.6	14.1	3.6	1.1	0	-----	.60	2-1
2	4	79.1	-----	79.6	64.6	41.4	6.0	2.3	.2	0	-----	-----	.90	3-1
2	3	83.8	-----	58.8	42.1	11.8	.8	.1	0	-----	-----	-----	1.20	4-1
2	4	76.1	56.9	38.0	20.8	3.1	.1	0	-----	-----	-----	-----	1.50	5-1
2	4	63.0	32.8	17.2	.6	0	0	0	-----	-----	-----	-----	1.80	6-1
						pH 8.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	94.8	0	0-1
2	4	97.2	-----	-----	99.1	89.1	89.1	82.5	83.0	77.6	75.2	58.7(2)	.15	0.5-1
2	4	98.4	-----	-----	94.9	88.2	84.4	79.2	79.8	69.1	56.0	50.4(3)	.30	1-1
2	4	98.3	-----	-----	90.6	87.2	81.2	75.0	67.5	52.9	22.1	11.0(4)	.60	2-1
2	4	94.8	-----	94.7	87.9	79.8	77.4	65.0	44.2	25.8	5.3	1.0	.90	3-1
2	4	94.0	-----	91.0	81.2	77.1	64.4	51.0	25.2	11.0	1.8	.2	1.20	4-1
2	4	92.5	88.8	77.3	73.6	65.8	40.0	20.1	4.5	.4	-----	-----	1.50	5-1
2	4	60.7	20.5	1.4	0	0	0	0	0	-----	-----	-----	1.80	6-1
						pH 9.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	86.2	0	0-1
2	4	95.6	-----	-----	94.6	-----	-----	85.4	-----	83.9	75.5	76.6(5)	.30	1-1
2	4	90.5	-----	-----	90.7	-----	-----	86.8	84.8	81.0	70.2	69.5(5)	.60	2-1
2	4	94.1	-----	-----	90.6	-----	-----	85.3	80.1	76.9	61.7	44.4(6)	.90	3-1
2	4	84.1	-----	-----	85.2	-----	82.7	77.6	72.5	61.4	50.9	35.7(7)	1.20	4-1
2	4	84.0	-----	-----	85.2	78.4	75.8	66.1	66.0	55.0	31.8	13.5(8)	1.50	5-1
2	4	89.5	-----	57.4	25.2	22.6	18.1	14.8	14.0	0	0	0	1.80	6-1

NOTE.—(1) 0 percent at 24 hours, (2) 58.4 percent at 360 minutes, and 0 percent at 24 hours, (3) 24.2 percent at 360 minutes and 0.1 percent at 24 hours, (4) 2.8 percent at 360 minutes and 0 percent at 24 hours, (5) 0 percent at 24 hours, (6) 7.4 percent at 360 minutes and 0 percent at 24 hours, (7) 0.40 percent at 360 minutes and 0 percent at 24 hours, (8) 0.1 percent at 360 minutes and 0 percent at 24 hours.

At 20° to 25° C.

pH 6.5

2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	94.8	-----	0.01	0-1
2	4	94.3	-----	[1] 82.0	67.4	58.5	23.8	4.9	0.1	0	0	-----	.15	0.5-1
2	4	89.5	-----	68.2	55.2	20.8	0	0	0	0	-----	-----	.30	1-1
2	4	77.8	59.6	52.7	21.4	0	0	0	0	0	-----	-----	.60	2-1
2	4	67.6	50.0	28.8	.4	0	0	0	0	-----	-----	-----	.90	3-1
2	4	54.2	29.7	3.7	0	0	0	0	-----	-----	-----	-----	1.20	4-1
2	4	43.4	6.3	0	0	0	0	-----	-----	-----	-----	-----	1.50	5-1
2	4	15.1	0	0	0	0	0	-----	-----	-----	-----	-----	1.80	6-1

[1] Interpolated figures.

TABLE 4.—*Average survival of* Eberthella typhosa, *expressed in percent of initial number when exposed to chloramine in various concentrations at pH 7.0, 8.5, and 9.5 at 2° to 6° C., and at pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5 at 20° to 25° C., with nitrogen content constant (0.3 p.p.m.) and contact time of* Cl_2 *and N, 1 hour before addition of bacteria*—Continued.

Number of strains	Number of tests	Average percentage surviving after exposure											Residual Cl_2 p. p. m.	Cl_2/N
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
						At 20° to 25° C.—Continued								
						pH 7.0								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	97.8	---------	0	0-1
2	4	95.6	-----	[1] 94.9	-----	93.7	67.3	49.9	27.4	30.6	3.4	0.6	.15	0.5-1
2	4	95.4	-----	83.1	77.4	62.6	13.4	1.3	0	0	0	---------	.30	1-1
2	4	88.6	-----	79.1	58.0	5.7	0	0	0	0	-----	---------	.60	2-1
2	4	75.5	66.8	53.9	9.0	0	0	0	-----	-----	-----	---------	.90	3-1
2	4	63.6	43.3	23.2	.3	0	0	0	-----	-----	-----	---------	1.20	4-1
2	4	46.4	22.0	1.4	0	0	0	0	-----	-----	-----	---------	1.50	5-1
2	4	20.6	.2	0.	0	0	0	0	-----	-----	-----	---------	1.80	6-1
						pH 7.8								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	96.7	92.2	0	0-1
2	4	94.6	-----	-----	96.6	70.4	29.4	4.9	0.2	0	0	0	.30	1-1
2	4	87.8	-----	76.8	60.7	20.1	.2	0	0	0	0	0	.60	2-1
2	4	83.8	73.7	55.3	38.4	3.2	0	0	0	0	-----	---------	.90	3-1
2	4	75.1	54.7	48.0	12.1	0	0	0	0	-----	-----	---------	1.20	4-1
2	4	59.4	43.0	25.4	5.2	0	0	0	0	-----	-----	---------	1.50	5-1
2	4	24.5	2.0	0	0	0	0	0	-----	-----	-----	---------	1.80	6-1
						pH 8.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	96.2	98.0	0	0-1
2	4	93.4	-----	[1] 97.0	100.0	83.7	58.4	24.9	6.1	0.7	0	0	.30	1-1
2	4	92.7	-----	90.3	81.2	53.6	15.8	6.7	0	0	0	---------	.60	2-1
2	4	90.8	98.6	82.8	75.4	29.4	1.5	0	0	0	-----	---------	.90	3-1
2	4	85.6	100.0	80.7	45.2	5.4	0	0	0	-----	-----	---------	1.20	4-1
2	5	86.1	74.0	55.1	22.3	0.6	0	0	-----	-----	-----	---------	1.50	5-1
2	3	8.1	0	0	0	0	0	-----	-----	-----	-----	---------	1.80	6-1
						pH 9.5								
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	89.0	-----	86.6	0	0-1
2	4	94.5	-----	-----	100.0	93.2	89.1	73.6	66.1	51.0	11.9	.4	.30	1-1
2	4	92.8	-----	96.0	92.4	86.2	67.9	55.6	35.8	8.4	0	0	.60	2-1
2	4	91.5	-----	100.0	79.2	73.9	52.4	33.7	4.1	.1	-----	---------	.90	3-1
2	4	84.8	-----	77.9	71.6	54.6	29.0	6.3	0	0	-----	---------	1.20	4-1
2	4	84.0	78.2	75.2	64.5	38.4	3.8	0	0	-----	-----	---------	1.50	5-1
2	4	43.8	0	0	0	0	0	0	-----	-----	-----	---------	1.80	6-1
						pH 10.5								
2	4	100.0	-----	-----	-----	-----	-----	73.3	-----	59.6	37.5	40.1	0	0-1
2	4	89.0	-----	-----	[1] 88.0	-----	85.4	75.6	55.2	54.9	30.0	17.4	.30	1-1
2	4	93.2	-----	-----	[1] 89.9	86.6	78.2	71.2	40.9	36.8	4.9	.5	.60	2-1
2	4	90.1	-----	-----	[1] 89.6	89.1	69.5	44.8	21.3	7.0	.3	0	.90	3-1
2	4	97.2	-----	-----	[1] 91.2	85.3	54.5	30.3	7.8	1.9	0	0	1.20	4-1
2	4	89.7	-----	86.8	76.2	68.8	27.4	6.6	.2	0	-----	---------	1.50	5-1
2	4	76.2	70.0	15.7	1.5	0	0	0	-----	-----	-----	---------	1.80	6-1

[1] Interpolated figures.

TABLE 5.—*Average survival of* Shigella dysenteriae *expressed in percent of initial numbers, when exposed to chloramine in various concentrations at pH 6.5, 7.0, 7.8, 8.5, 9.5 and 10.5 at 20°–25° C., with nitrogen content constant (0.3 p. p. m.) and contact of Cl_2 and N, 1 hour before addition of bacteria*

Number of strains	Number of tests	Average percentage survival after exposure											Residual Cl_2 p. p. m.	
		1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	0 minutes	Ratio
pH 6.5														
2	4	100.0	-----	-----	-----	-----	-----	-----	-----	-----	94.0	-----	0.01	0–1
2	4	99.3	82.2	70.4	50.1	26.0	6.2	0.8	0	0	0	-----	.15	0.5–1
2	4	97.6	53.8	39.7	21.6	2.8	0	0	0	0	-----	-----	.30	1–1
2	4	68.2	34.1	19.9	4.2	0	0	0	-----	-----	-----	-----	.60	2–1
2	4	51.7	19.0	4.6	0	0	0	0	-----	-----	-----	-----	.90	3–1
2	4	40.4	7.8	.9	0	0	0	0	-----	-----	-----	-----	1.20	4–1
2	4	28.2	.4	0	0	0	0	-----	-----	-----	-----	-----	1.50	5–1
2	4	6.5	0	0	0	0	0	-----	-----	-----	-----	-----	1.80	6–1
pH 7.0														
2	4	100.0	-----	-----	-----	-----	-----	96.7	-----	85.8	88.0	-----	Trace	0–1
2	4	95.5	-----	76.2	43.3	32.8	11.4	2.1	0.1	0	0	-----	0.15	0.5–1
2	4	95.3	63.2	51.4	33.6	15.4	.4	0	0	0	0	-----	.30	1–1
2	4	84.5	44.6	28.9	11.1	.4	0	0	0	-----	-----	-----	.60	2–1
2	4	62.6	27.8	11.8	1.9	0	0	0	-----	-----	-----	-----	.90	3–1
2	4	46.6	19.5	6.5	.1	0	0	0	-----	-----	-----	-----	1.20	4–1
2	4	37.9	7.3	.4	0	0	0	-----	-----	-----	-----	-----	1.50	5–1
2	4	45.6	.6	0	0	0	0	-----	-----	-----	-----	-----	1.80	6–1
pH 7														
2	4	100.0	-----	-----	-----	-----	-----	93.7	-----	-----	91.2	-----	0	0–1
2	4	91.0	-----	46.5	40.7	28.8	5.4	1.6	0.1	0	0	-----	.30	1–1
2	4	74.5	45.3	35.8	24.7	6.4	.1	0	0	0	-----	-----	.60	2–1
2	4	69.4	31.7	23.9	8.6	.3	0	0	0	-----	-----	-----	.90	3–1
2	4	50.2	28.4	17.7	3.1	0	0	0	-----	-----	-----	-----	1.20	4–1
2	4	42.6	19.2	6.6	.5	0	0	-----	-----	-----	-----	-----	1.50	5–1
2	4	28.4	4.0	.4	0	0	0	-----	-----	-----	-----	-----	1.80	6–1
pH 8.5														
2	4	100.0	-----	-----	-----	-----	-----	100.0	-----	100.0	84.1	-----	0	0-
2	4	95.4	-----	89.4	63.3	59.5	37.0	13.9	1.9	.1	0	-----	.30	1-
2	4	90.6	-----	66.4	46.2	33.3	6.8	.2	0	0	0	-----	.60	2-
2	4	86.2	62.3	47.4	34.7	25.5	0.7	0	0	0	-----	-----	.90	3-
2	4	84.4	47.2	44.0	29.6	7.1	0	0	0	-----	-----	-----	1.20	4-
2	4	65.0	43.4	37.0	22.1	3.4	0	0	-----	-----	-----	-----	1.50	5-
2	4	40.7	15.2	6.9	.1	.0	0	-----	-----	-----	-----	-----	1.80	6-
pH 9.5														
2	4	100.0	-----	-----	-----	-----	-----	100.0	-----	89.0	87.0	84.1	0	0–1
2	4	95.5	-----	-----	100.0	93.7	91.2	77.3	69.4	35.8	2.0	.1	.30	1–1
2	4	97.6	-----	-----	79.6	68.5	63.2	37.5	12.3	.5	0	0	.60	2–1
2	4	97.1	-----	63.3	56.8	52.2	33.1	10.0	0.2	0	0	-----	.90	3–1
2	4	97.3	57.2	55.8	51.7	42.1	12.6	.6	0	0	-----	-----	1.20	4–1
2	4	74.8	48.6	46.5	50.7	27.9	.9	0	0	-----	-----	-----	1.50	5–1
2	4	44.7	26.0	14.8	6.1	0	0	0	-----	-----	-----	-----	1.80	6–1
pH 10.5														
2	4	100.0	-----	-----	-----	-----	-----	84.6	-----	68.0	60.2	53.3	0	0–1
2	4	89.3	-----	-----	86.2	86.8	86.8	81.9	64.0	52.9	31.6	23.5	.30	1–1
2	4	91.2	-----	-----	83.8	78.6	71.2	52.5	37.7	26.6	9.2	1.3	.60	2–1
2	4	89.2	-----	69.7	71.2	62.6	54.3	33.2	22.0	8.2	.3	0	.90	3–1
2	4	82.7	60.6	61.6	58.8	50.0	37.8	26.3	5.4	.9	0	-----	1.20	4–1
2	4	66.9	49.6	43.1	49.1	43.5	28.5	8.0	1.0	0	-----	-----	1.50	5–1
2	4	50.5	38.9	36.6	15.4	8.5	.5	0	-----	-----	-----	-----	1.80	6–1

TABLE 6.—*Average survival of various species of* Shigella *expressed in percent of initial number when exposed to chloramine in various concentrations at pH 8.5 and at 20° to 25° C., with nitrogen content constant, (0.3 p. p. m.) and contact of* Cl_2 *and N, 1 hour before addition of bacteria*

Species of *Shigella*	Number of strains	Number of tests	Average percentage surviving after exposure at chloramine concentration given										
			1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes
0.00 p. p. m. Cl_2/N, 0–1													
Dysenteriae	3	6	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	88.2
Sonnei	4	8	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	82.0
Paradysenteriae [1]	5	10	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	89.9
0.30 p. p. m. Cl_2/N, 1–1													
Dysenteriae	3	6	94.2	-----	76.7	55.4	57.8	35.6	11.2	1.0	0.1	0.0	0.0
Sonnei	4	8	95.3	-----	-----	89.6	87.7	81.4	69.8	35.5	8.3	0,1	0.0
Paradysenteriae [1]	5	10	91.2	-----	-----	68.9	59.0	33.2	9.7	0.9	0.1	0.0	0.0
0.60 p. p. m. Cl_2/N, 2–1													
Dysenteriae	3	6	89.0	-----	58.0	49.3	35.9	4.8	0.1	0.0	0.0	0.0	-----
Sonnei	4	8	91.8	-----	-----	86.7	69.0	47.6	16.8	1.2	0.1	0.0	-----
Paradysenteriae [1]	5	10	81.2	-----	62.4	54.9	29.9	3.2	0.1	0.0	0.0	0.0	-----
0.90 p. p. m. Cl_2/N, 3–1													
Dysenteriae	3	6	84.0	61.0	49.4	39.2	23.6	0.4	0.0	0.0	0.0	-----	-----
Sonnei	4	8	91.0	-----	76.9	71.5	53.0	14.8	0.9	0.1	0.0	0.0	-----
Paradysenteriae [1]	5	10	79.3	52.8	52.4	38.7	10.9	0.1	0.0	0.0	0.0	-----	-----
1.20 p. p. m. Cl_2/N, 4–1													
Dysenteriae	3	6	72.5	49.6	44.9	32.2	6.0	0.0	0.0	0.0	-----	-----	-----
Sonnei	4	8	85.8	71.2	66.2	56.2	33.4	2.2	0.1	0.0	-----	-----	-----
Paradysenteriae [1]	5	10	68.7	47.8	40.1	27.4	3.4	0.0	0.0	0.0	-----	-----	-----
1.50 p. p. m. Cl_2/N, 5–1													
Dysenteriae		6	63.9	46.2	37.1	24.4	1.9	0.0	0.0	-----	-----	-----	-----
Sonnei		8	85.2	67.8	66.8	52.4	19.8	0.2	0.0	-----	-----	-----	-----
Paradysenteriae [1]		10	60.1	41.3	36.2	18.0	0.6	0.0	0.0	-----	-----	-----	-----
1.80 p. p. m. Cl_2/N, 6–1													
Dysenteriae	3	6	29.9	7.6	3.4	0.1	0.0	0.0	0.0	-----	-----	-----	-----
Sonnei	4	8	22.6	1.0	0.1	0.0	0.0	0.0	0.0	-----	-----	-----	-----
Paradysenteriae [1]	5	10	24.3	0.2	0.0	0.0	0.0	0.0	0.0	-----	-----	-----	-----

[1] Average results from 1 Flexner V, 1 Flexner W, 2 Flexner Z, and 1 Boyd 88, 2 tests with each. Of these species the Flexner Z strains were slightly more sensitive.

TABLE 7.—*Average survival of* Shigella sonnei *expressed in percent of initial numbers when exposed to chloramine in various concentrations at pH 8.5 and at 2° to 6° C., with nitrogen content constant (0.3 p. p. m.) and contact time of Cl_2 and N, 1 hour before addition of bacteria.*

Number of strains	Number of tests	Average percentage surviving after exposure: 1 minute	3 minutes	5 minutes	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	360 minutes	1,440 minutes	Residual Cl_2 p.p.m.: 0 minute	Cl_2/N: Ratio
								pH 8.5								
4	8	100.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	85.1	82.6	67.2	0	0-1
4	8	97.5	-----	-----	91.9	-----	-----	84.5	83.0	76.6	67.1	68.0	59.3	2.0	.15	5-1
4	8	94.3	-----	-----	91.8	-----	-----	78.1	72.0	70.4	59.2	53.9	41.1	0	.30	1-1
4	8	97.1	-----	-----	91.5	-----	-----	71.9	61.0	55.9	33.1	19.2	7.0	0	.60	2-1
4	8	96.5	-----	-----	89.0	-----	65.0	63.0	44.8	32.7	11.4	6.0	2.5	0	.90	3-1
4	8	95.1	-----	-----	84.6	-----	59.4	48.0	29.4	17.4	5.4	2.2	.2	-----	1.20	4-1
4	8	92.5	-----	-----	77.9	57.8	42.6	26.8	9.8	6.1	1.2	0	-----	-----	1.50	5-1
4	8	57.1	32.1	20.8	11.1	7.1	3.7	1.5	0	0	0	-----	-----	-----	1.80	6-1

TABLE 8.—*Average survival of* Escherichia coli, *expressed in percent of initial numbers, when exposed to chloramine with the residual chlorine content constant, 0.3 p. p. m., and the nitrogen content varied, at pH 7.0, 8.5, and 10.5 and at 20° to 25° C., with contact time of 1 hour for Cl_2 and N, before addition of bacteria*

Number of strains	Number of tests	Average percentage surviving after exposure: 1 minute	10 minutes	20 minutes	40 minutes	60 minutes	90 minutes	120 minutes	150 minutes	180 minutes	240 minutes	Residual Cl_2 p. p. m.: 0 minutes	Cl_2/N: Ratio
						pH 7.0							
2	6	100.0	-----	-----	-----	-----	-----	-----	-----	-----	99.4	0	0-7
2	4	97.8	88.8	67.7	25.1	7.0	0.6	0.2	-----	0	0	.30	1-1
2	4	98.0	88.6	63.7	33.2	14.5	2.9	1.0	-----	.4	.1	.30	1-7
2	4	93.1	91.4	77.4	46.3	18.8	3.2	1.0	-----	.4	.3	.30	1-25
						pH 8.5							
2	8	100.0	-----	-----	-----	-----	-----	-----	-----	-----	95.6	0	0-7
2	6	99.2	93.3	90.4	81.4	67.2	37.8	14.6	-----	3.7	.1	.30	1-1
2	8	96.6	97.8	85.8	74.6	65.0	46.6	32.2	38.0	12.6	3.8	.30	1-3
2	8	96.5	96.0	85.6	73.3	59.5	44.7	34.8	39.4	14.0	8.1	.30	1-7
2	4	95.3	96.7	93.4	80.8	75.6	65.9	56.8	40.4	29.0	16.3	.30	1-10
2	2	100.0	98.0	82.8	62.1	78.1	65.3	63.4	50.6	33.0	26.0	.30	1-25

		Average percentage surviving after exposure: 1 minute	10 minutes	20 minutes	60 minutes	90 minutes	120 minutes	180 minutes	240 minutes	360 minutes	1,440 minutes		
						pH 10.5							
2	4	100.0	-----	-----	96.1	-----	85.6	81.7	75.8	71.3	73.1	0	0-7
2	4	97.6	88.2	-----	91.8	81.8	74.8	69.2	66.0	24.3	0	.30	1-1
2	4	94.1	92.0	-----	87.2	80.3	80.5	79.3	67.0	16.8	0	.30	1-7
2	4	91.5	87.2	-----	86.4	76.8	72.9	63.7	49.9	5.0	0	.30	1-25

TABLE 9.—*Time in minutes required to produce a 100-percent kill of bacteria when exposed to chloramine at various hydrogen-ion concentrations and at two temperatures*

2° to 6° C.

Cl_2/N ratio	Residual Cl_2 p. p. m.	pH 7.0		pH 8.5			pH 9.5	
		Esch. coli	*Eber. typhosa*	*Esch. coli*	*Eber. typhosa*	*S. sonnei*	*Esch. coli*	*Eber. typhosa*
0.5-1	0.15	>240	1,440	>1,440	1,440	>1,440	----------	----------
1-1	.30	>240	>240	>1,440	>1,440	1,440	>1,440	1,440
2-1	.60	180	180	1,440	1,440	1,440	>1,440	1,440
3-1	.90	120	120	360	>240	1,440	1,440	1,440
4-1	1.20	90	90	360	>240	>360	1,440	1,440
5-1	1.50	60	60	360	180	240	1,440	1,440
6-1	1.80	40	20	20	10	90	90	120

20° to 25° C.

Cl_2/N ratio	Residual Cl_2 p.p.m.	pH 6.5					pH 7.0				
		Esch. coli	*Aer. aerogenes*	*Ps. pyocyanea*	*Eber. typhosa*	*S. dysenteriae*	*Esch. coli*	*Aer. aerogenes*	*Ps. pyocyaneae*	*Eber. typhosa*	*S. dysenteriae*
0.5-1	0.15	>60	180	120	120	90	>120	240	240	>240	120
1-1	.30	60	90	60	40	40	90	120	90	90	60
2-1	.60	40	40	40	20	20	40	60	40	40	40
3-1	.90	20	40	20	20	10	40	40	20	20	20
4-1	1.20	20	20	20	10	10	20	40	20	20	20
5-1	1.50	10	10	10	5	5	20	20	20	10	10
6-1	1.80	5	5	5	3	3	5	5	10	5	5

20° to 25° C.

Cl_2/N ratio	Residual Cl_2 p.p.m.	pH 7.8					pH 8.5						
		Esch. coli	*Aer. aerogenes*	*Ps. pyocyaneae*	*Eber. typhosa*	*S. dysenteriae*	*Esch. coli*	*Aer. aerogenes*	*Ps. pyocyaneae*	*Eber. typhosa*	*S. dysenteriae*	*S. sonnei*	*S. paradysenteriae*
0.5-1	0.15	------	------	------	------	------	>360	------	------	------	------	------	------
1-1	.30	180	>240	180	120	120	300	240	180	180	180	240	180
2-1	.60	90	180	90	60	60	120	>120	90	90	90	180	90
3-1	.90	60	90	40	40	40	90	120	60	60	60	120	60
4-1	1.20	40	60	40	20	20	60	90	40	40	40	90	40
5-1	1.50	20	40	20	20	20	40	60	40	40	40	60	40
6-1	1.80	20	20	10	5	10	20	5	40	3	20	10	5

20° to 25° C.

Cl_2/N ratio	Residual Cl_2 p. p. m.	pH 9.5					pH 10.5				
		Esch. coli	*Aer. aerogenes*	*Ps. pyocyaneae*	*Eber. typhosa*	*S. dysenteriae*	*Esch. coli*	*Aer. aerogenes*	*Ps. pyocyaneae*	*Eber. typhosa*	*S. dysenteriae*
0.5-1	0.15	>360	360	------	------	------	>360	>240	------	------	------
1-1	.30	>240	>240	240	>240	>240	>360	>240	>240	>240	>240
2-1	.60	240	>240	180	180	180	>360	>240	240	>240	>240
3-1	.90	180	>180	120	150	120	>300	>240	120	240	240
4-1	1.20	90	>120	120	90	90	>240	>240	120	180	180
5-1	1.50	60	>90	90	60	60	150	>180	90	120	120
6-1	1.80	5	20	60	3	20	60	40	60	20	60

Additional data, which are available concerning (*a*) the influence of variations in the nitrogen content when the amount of chlorine added is constant, (*b*) the influence of the time of contact between chlorine and nitrogen before bacteria are exposed to the resultant chloramine, and (*c*) the relative efficiency of free chlorine and chloramine as bactericidal agents, are not presented in tabular form, as they are quite comparable to these shown in the tables presented. However, the implications of these data will be considered in the discussion of the results obtained.

DISCUSSION OF RESULTS

To aid in demonstrating the influence of certain factors on the bactericidal efficiency of chloramine and to facilitate the discussion of the results, parts of the data shown in the tables have been presented in diagrams. In selecting the portions of the data for graphic presentation, an effort was made to use results typical of general trends, illustrating a particular point in question. Because of the number of factors affecting the results, however, all of the data concerned with any one variable could not be presented in one figure without considerable confusion. Similarly, the preparation of a series of figures, demonstrating in the aggregate the effects of all of the factors under all conditions, would not be of material value and would add greatly to the space requirements of this report. Consequently, the data presented thus have been limited, and if the results presented in the figures do not fulfill the particular need of the reader, appropriate data for this purpose may be selected from the tables and plotted in a similar manner.

The influence of various factors on the bactericidal properties of chloramine and the relative efficiency of free chlorine and chloramine in water disinfection processes will be discussed in the text which follows.

INFLUENCE OF RESIDUAL AND EXPOSURE TIME

In figures 1A to 1F, inclusive, the average percentage of survival of *Esch. coli* exposed to chloramine in varying concentrations and at two temperature ranges, 2° to 6° C. and 20° to 25° C., have been plotted against time in minutes. Results from waters at three hydrogen-ion concentrations, pH 7.0, 8.5, and 9.5, were used. Data for periods of exposure up to 120 minutes only are included in the plotted points with percentages for longer periods indicated in the margin.

It is noted that, regardless of the temperature of the water or its hydrogen-ion concentration, the amount of chloramine present and the length of the exposure time markedly affected the results. Without exception an increase in the amount of chloramine present

increased the rate of kill of *Esch. coli* and any increase in exposure time likewise increased the extent of the kill. However, marked increases in the extent of kill were not observed in 60 minutes of exposure at 2° to 6° C., with less than about 1.2 p. p. m. residual at pH 8.5, and 1.5 p. p. m. residual at pH 9.5. At the higher temperature range, 20° to 25° C., residuals of about 0.3 p. p. m. and 0.6 p. p. m., respectively, were required to obtain approximately the same kill.

The results to be anticipated in practical operation with exposures up to 240 minutes, using amounts of chloramine varying from 0.15 to 1.8 p. p. m., in waters of pH 7.0 to 9.5, may be determined from these figures and tables. However, it should be noted that these data probably represent the maximum disinfecting action which can be expected from chloramine under the conditions given, as the suspending waters used in these tests did not contain (*a*) any substance which might reduce either the amount or the bactericidal potency of the chloramine, or (*b*) any particulate matter which might act as a protective covering for bacterial cells.

In figures 1G to 1J, inclusive, corresponding data for two other genera, *Eber. typhosa* and *S. sonnei*, for one pH value only, 8.5, have been plotted. Additional data for these two genera at other pH values, and for the other genera studied, which have not been presented graphically, may be found in tables 1 to 6. These figures show that at pH 8.5 and at 2° to 6° C., the influence of the time of exposure to chloramine, and the amount of chloramine present, produced approximately the same effect on the rate and extent of kill of these two genera as was observed for *Esch. coli*. The same is true at the higher temperature, 20° to 25° C., when the residuals were 0.9 p. p. m. or more. At lower residuals, strains of *S. sonnei* tested appeared to be slightly more resistant than *Esch. coli*.

EFFECT OF VARIATIONS IN HYDROGEN-ION CONCENTRATION

In figures 2A, 2B, 2C, and 2D selected data are presented to show the influence of the pH of the water on the bactericidal efficiency of chloramine. The selection of the data to be used was made by limiting the pH values compared to pH 7.0, 8.5, and 9.5, and by eliminating the time variable from consideration, all results plotted being those obtained after a 10-minute or a 60-minute exposure. In figures 2A and 2C these results for the percentage survival of *Esch. coli* and *Eber. typhosa*, respectively, obtained after 10 minutes' exposure, are plotted against residual chlorine in parts per million. In figures 2B and 2D corresponding results obtained after 60 minutes of exposure are shown. Results obtained at both the temperature ranges studied are presented in these figures.

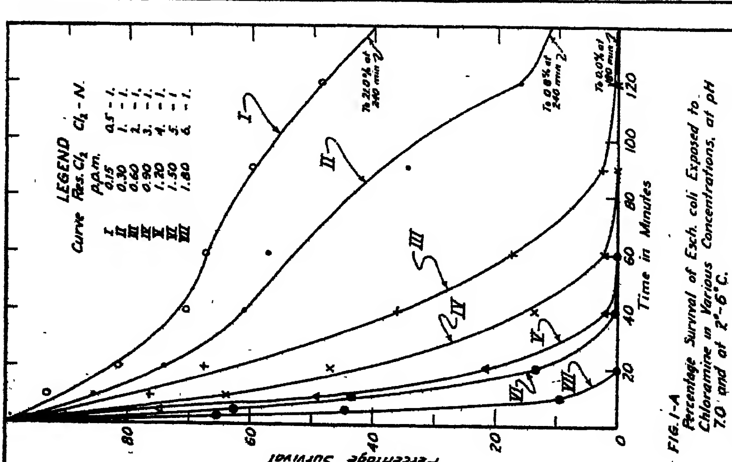

FIG. 1-A Percentage Survival of Esch. coli Exposed to Chloramine in Various Concentrations, at pH 7.0 and at 2°-6°C.

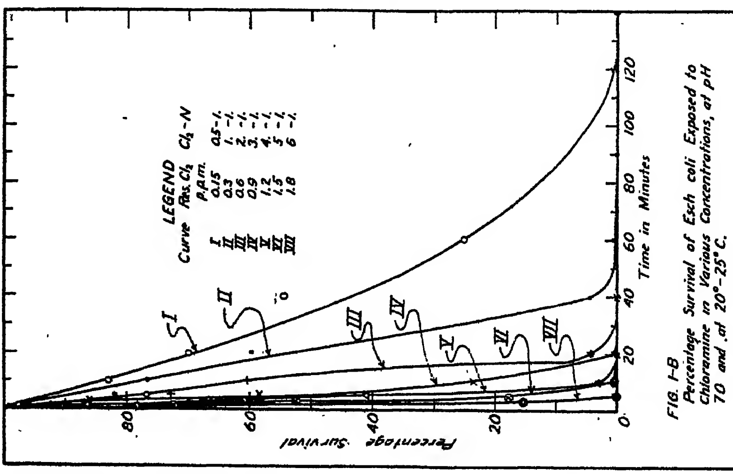

FIG. 1-B Percentage Survival of Esch. coli Exposed to Chloramine in Various Concentrations, at pH 7.0 and at 20°-25°C.

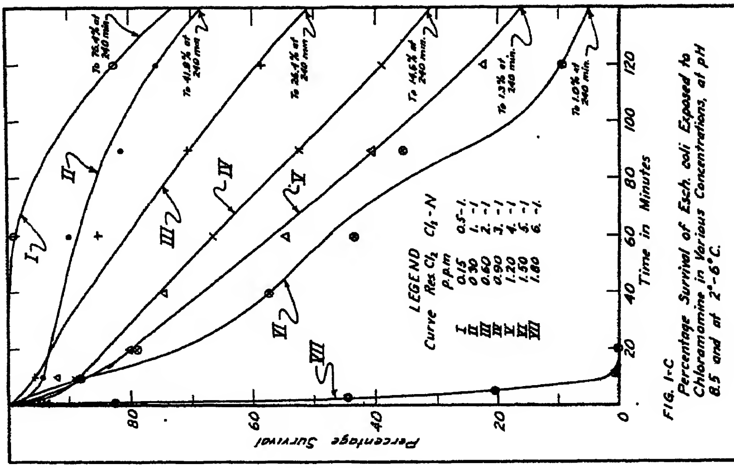

FIG. 1-C Percentage Survival of Esch. coli Exposed to Chloramomine in Various Concentrations, at pH 8.5 and at 2°-6°C.

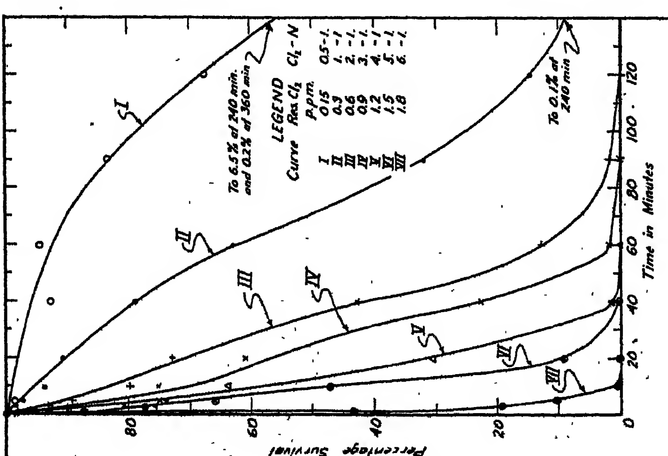

FIG. 1-D Percentage Survival of Esch. coli Exposed to Chloramine in Various Concentrations, At pH 8.5 and at 20°-25°C.

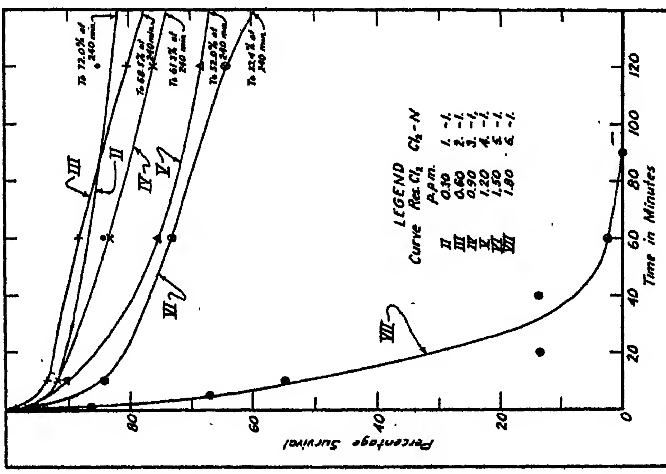

FIG. 1-E Percentage Survival of Esch. coli Exposed to Chloramine in Various Concentrations, at pH 9.5 and at 2°-6°C.

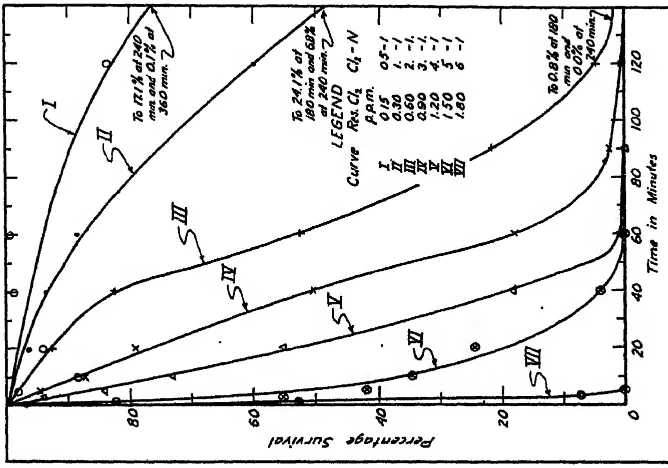

FIG. 1-F Percentage Survival of Esch. coli Exposed to Chloramine in Various Concentrations, At pH 9.5 and at 20°-25°C.

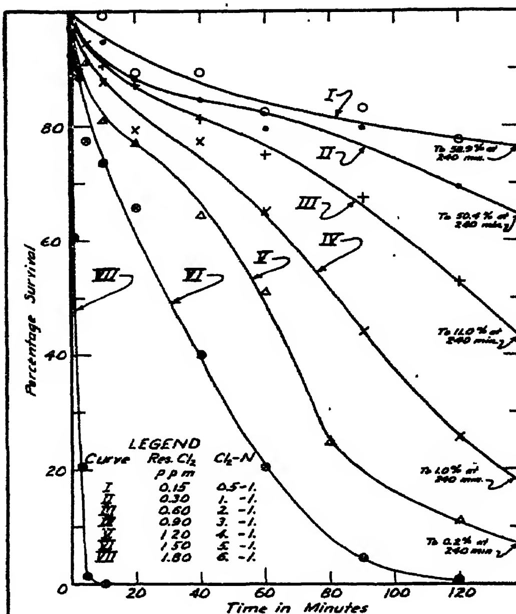

FIG. 1-G
Percentage Survival of Eber. typhosa Exposed to Chloramine in Various Concentrations at pH 8.5 and at 2°-6°C.

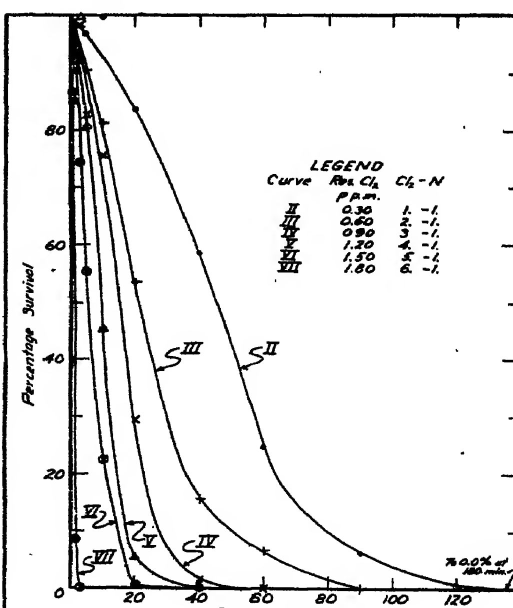

FIG 1-H
Percentage Survival of Eber. typhosa Exposed to Chloramine in Various Concentrations at pH 8.5 and at 20°-25°C.

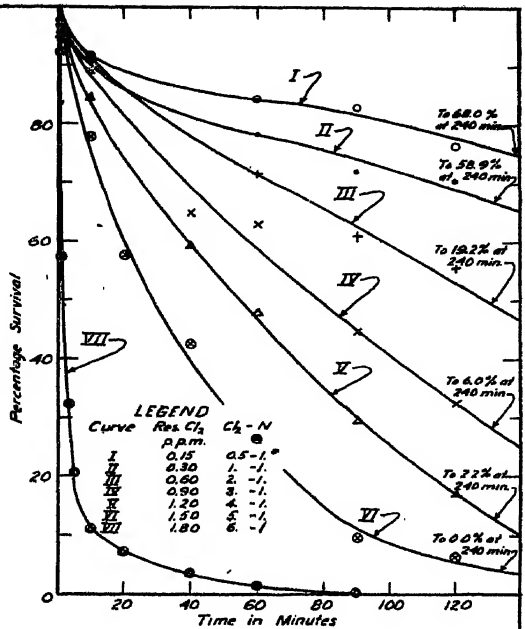

FIG. 1-I
Percentage Survival of Sh. sonnei Exposed to Chloramine in Various Concentrations, at pH 8.5 and at 2°-6°C.

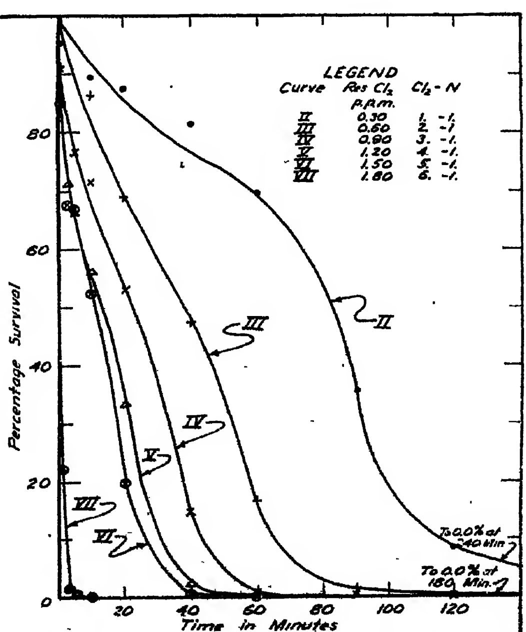

FIG. 1-J
Percentage Survival of Sh. sonnei Exposed to Chloramine in Various Concentrations at pH 8.5 and at 20°-25°C.

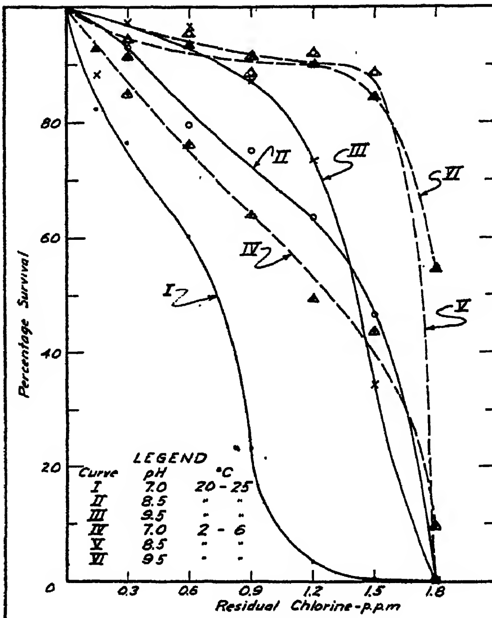

FIG. II-A
Survival of Esch. coli at pH 7.0, 8.5 and 9.5, at 2°-6°C and at 20°-25°C after Exposure to Chloramine in Various Concentrations for 10 Minutes

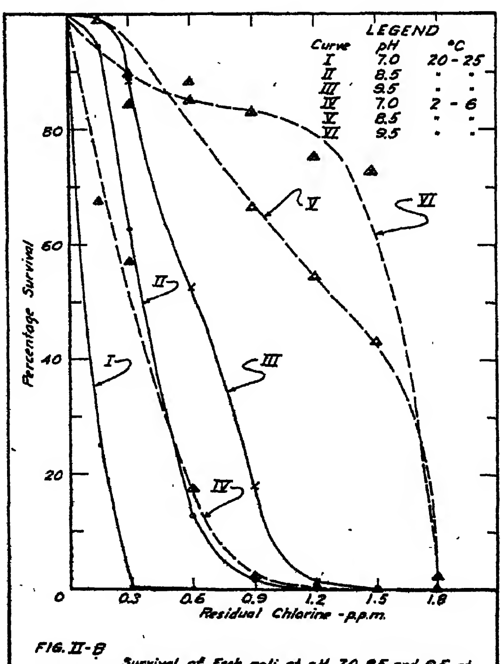

FIG. II-B
Survival of Esch. coli at pH 7.0, 8.5 and 9.5, at 2°-6°C and at 20°-25°C after Exposure to Chloramine in Various Concentrations for 60 Minutes

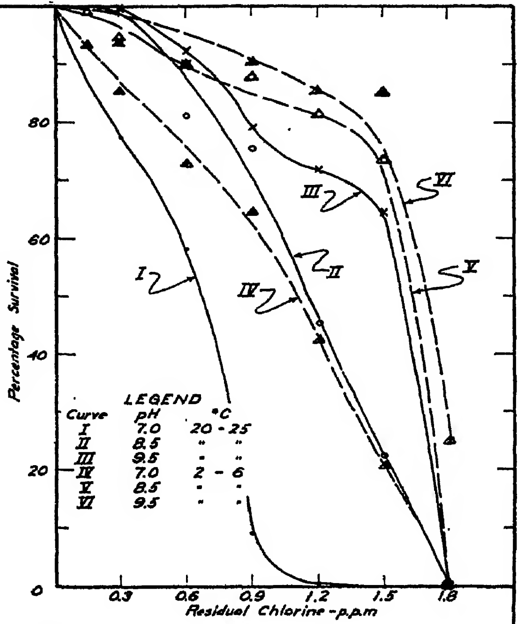

FIG. II-C
Survival of Eber. typhosa at pH 7.0, 8.5 and 9.5, at 2°-6°C and 20°-25°C after Exposure to Chloramine in Various Concentrations for 10 Minutes

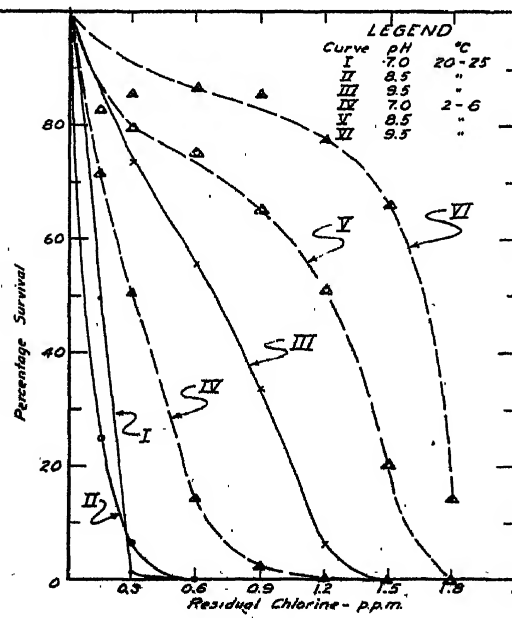

FIG. II-D
Survival of Eber. typhosa at pH 7.0, 8.5 and 9.5, at 2°-6°C. and 20°-25°C. after Exposure to Chloramine in Various Concentrations for 60 Minutes

The marked effect of the hydrogen-ion concentration on the bactericidal efficiency of chloramine (or on the extent of availability of the chloramine present) is indicated quite definitely. It is evident that the pH effect becomes more marked with increased periods of exposure, for the ratios of the amounts of chloramine required to produce a 50-percent kill of *Esch. coli* at pH 7.0 and at 8.5 are greater for the 60-minute period of exposure at both temperature ranges. When *Esch. coli* were exposed to the same residuals at pH 7.0 and 8.5, and a 100-percent kill was used as a criterion, two to six times (avg. 3.4) longer exposure periods were required at pH 8.5. A further increase in pH (8.5 to 9.5) requires approximately another twofold to fourfold increase in the exposure time. Similarly, to obtain a 100-percent kill of *Esch. coli* in the same exposure interval at pH 8.5 required 1.5 to 3 times (avg. 2.3) the residual needed at pH 7.0. Further shift of the pH from 8.5 to 9.5 again required a 1.3-fold increase in residual.

EFFECT OF TEMPERATURE

The effect of variations in temperature on the bactericidal efficiency of chloramine has been illustrated in figures 3A and 3B. Here again, to avoid confusion, limited data only are presented. In figure 3A the average results obtained after 60 minutes' exposure in waters of pH 8.5 for *Esch. coli*, *Eber. typhosa*, and *S. sonnei*, at 20° to 25° C. and at 2° to 6° C., curves I, II, and III, and IV, V, and VI, respectively, are plotted against residual chlorine in parts per million. Thus to observe the effects of temperature, when all other variables are held constant, comparison may be made of (*a*) curves I and IV for *Esch. coli*, (*b*) curves II and V for *Eber. typhosa*, and (*c*) curves III and VI for *S. sonnei*. The marked effect of a 20° temperature differential is quite apparent. It is approximately the same for each of the three genera shown. The greatest differences are observed when the kills are in the range of 35 to 95 percent of the initial number. When the comparisons are based on a 100-percent kill, or zero survival, and the results obtained at pH values of 7.0 and 9.5 (table 9) as well as at pH 8.5, it is noted that (*a*) with a given concentration of chloramine approximately nine times (range of ratios 1–18) the exposure times were required at the lower temperature, and (*b*) with the same exposure times approximately 2.5 times (range of ratios, 1–4) as much chloramine was needed to produce a 100-percent kill at the lower temperature.

In figure 3B results are presented which were obtained with *S. sonnei* (the most resistant of the various pathogens studied), in waters of pH 8.5 after exposures for 10 and 60 minutes, respectively, at the two temperature ranges. The average data for the 10-minute observations are shown in curves I and II, and for the 60-minute results in

curves III and IV. The temperature effects are similar to those observed with *Esch. coli.* with the trends more consistently defined for the 60-minute exposure period, as would be expected. It may be noted also that a very rapid initial decrease, with low chloramine concentration, was indicated for *S. sonnei* at the low temperature which was not observed at the higher temperature. The same effect was observed with *Eber. typhosa* (fig. 3A). Although data to establish this theory are not available, it is thought that this accentuated initial decrease may have been brought about by the shock induced by the sudden transfer of a suspension of bacteria grown at 37° C. to a temperature of 2° C. With the heavier dosages of chloramine, this reduction, possibly induced by shock, would be concealed by the more extensive kills produced by the chloramine.

VARIATIONS IN GENUS RESISTANCE

In this study the chloramine resistance of 2 strains each of 4 genera, *Escherichia*, *Aerobacter*, *Pseudomonas*, and *Eberthella*, and of 13 strains of 1 genus, *Shigella*, was investigated. In figures 4A, 4B, and 4C variations in their resistance to chloramine are shown, by plotting the average percentages of survival of the various genera against residual chlorine in parts per million as chloramine. Only results obtained after an exposure period of 10 minutes, and at the higher temperature range, are presented in these figures. Additional data for other exposure periods and for the lower temperature, if desired, may be found in tables 1 to 7 and similarly plotted. Only one exposure period could be shown in the figures without confusion and the 10-minute period offered the maximum variations. Data obtained in waters at pH 7.0, 8.5, and 9.5 are shown in figures 4A, 4B, and 4C, respectively. It should be noted that in figure 4B average results obtained with 4 strains of *S. sonnei* are presented which are not represented in figures 4A and 4C as these strains were secured toward the end of the study and were tested at pH 8.5 only.

At pH 7.0, as illustrated in figure 4A, the *A. aerogenes* strains were definitely the most resistant and *S. dysenteriae* the least resistant of the five genera studied. *Esch. coli*, *Ps. pyocyanea* and *Eber. typhosa* results are in very close agreement, with pyocyanea and typhosa possibly slightly more resistant than coli with chloramine residuals of about 0.7 p. p. m. or less, and less resistant with larger residuals. At pH 8.5 (fig. 4B), *S. dysenteriae* again is the most sensitive. The other genera tested, including *S. sonnei*, all showed approximately the same resistance. However, in this connection the following points should be emphasized: (*a*) *P. pyocyanae* at pH 8.5 were more resistant with chloramine residuals greater than about 1.2 p. p. m.; (*b*) with the exception of (*a*), *Esch. coli* strains were more resistant than any of the other genera studied, and (*c*) *S. sonnei*, in contrast

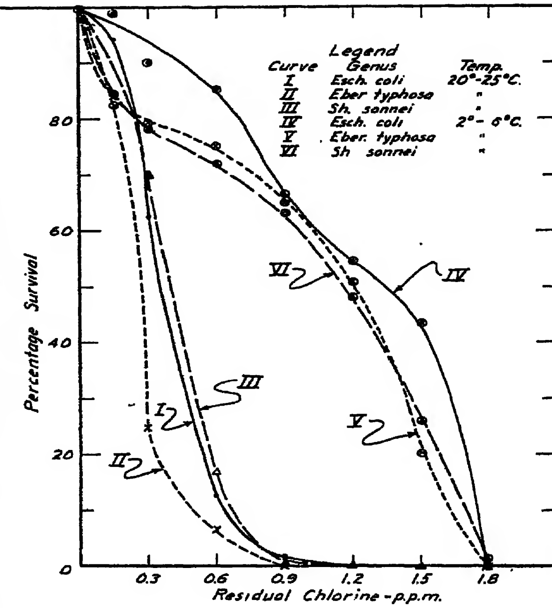

FIG. III-A
Percentage Survival of Esch. coli, Eber. typhosa and Sh. sonnei Exposed 60 Minutes to Chloramine in Various Concentrations at pH 8.5, at 2°-6°C. and 20°-25°C.

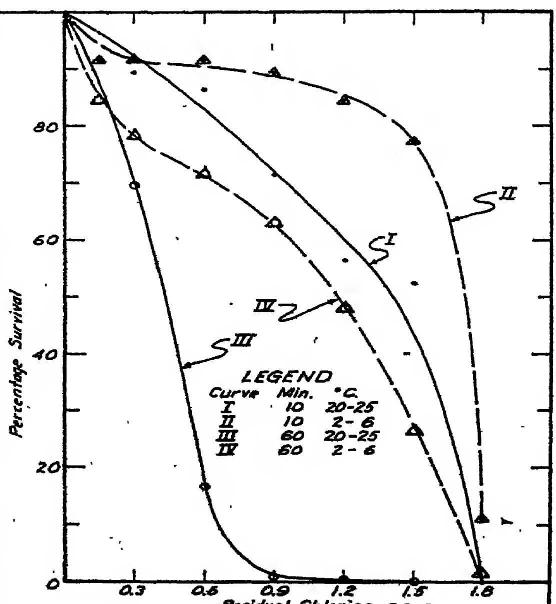

FIG. III-B
Survival of Sh. sonnei at pH 8.5 at 2°-6°C. and 20°-25°C. after Exposure to Chloramine in Various Concentrations for 10 and 60 Minutes

with the fellow-member of its genus, *S. dysenteriae*, was practically as resistant as *Esch. coli* throughout the range of chloramine concentrations used. At pH 9.5 (fig. 4C), the trends were about the same as at pH 7.0 and 8.5, with the exception that *S. dysenteriae*, though still remaining the most sensitive genus at the lower chloramine concentrations, appears to be more resistant with the largest concentration, 1.8 p. p. m.

EFFECT OF EXCESS NITROGEN

In the results discussed heretofore the nitrogen content of the waters used was kept constant at 0.3 p. p. m. and the chlorine content was varied so that Cl_2:N ratios of 0.5:1 to 6.0:1, were obtained in all series. In a few series of tests with *Esch. coli* these ratios were extended to 10:1. In some natural waters the nitrogen content may exceed considerably the usual amounts of chlorine added in practical water treatment and observations were made on the effect of excessive amounts of nitrogen on the bactericidal efficiency of the chloramine produced. Eighteen series of tests were made with *Esch. coli* in waters at pH 7.0, 8.5, and 10.5 with Cl_2:N ratios varying from 1:1 to 1:25. These waters were held at 20° to 25° C, and there was a contact period of 1 hour for Cl_2 and N, before the test bacteria were added to the water. The results are presented in table 8.

Study of these results indicates that in waters at pH 7.0 and 8.5 there was a definite tendency for the larger amounts of nitrogen to reduce slightly the percentage of kill. At most of the time intervals of examination this tendency was consistent, increasing the reduction slightly with each increment of nitrogen. Although this tendency as observed was consistent, in no instance was there a marked difference. The apparent effect was to slow up the rate of kill slightly so that at pH 7.0, for instance, a 100-percent kill was observed with the 1:1 ratio after 3 hours, and with the 1:7 and the 1:25 ratios a resistant minority persisted not only after 3 hours, but also after 4 hours of exposure.

In waters at pH 10.5 increased amounts of nitrogen after long periods of exposure appeared to enhance rather than to reduce the percentage of kill. Consequently, it would appear logical to include with Cl_2:N ratios in which the N exceeds the Cl_2 by 7 times, or more, that (*a*) the effect on the bactericidal efficiency of the chloramine produced was not marked; (*b*) in waters of pH 7.0 to 8.5 the efficiency decreased slightly with nitrogen increases; and (*c*) in waters of pH 10.5 the efficiency increased slightly with nitrogen increases.

EFFECT OF CONTACT TIME OF Cl_2 AND NH_3

As has been pointed out previously in this report, a contact period of 1 hour for the chlorine and ammonia nitrogen, before the suspen-

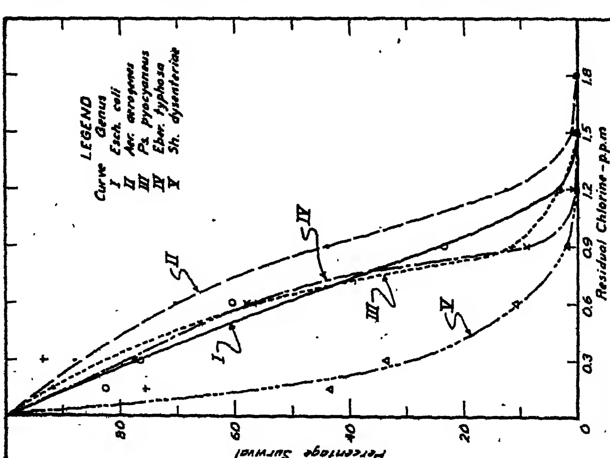

FIG. IV-A Relative Survival of Five Genera of Bacteria Exposed to Chloramine in Various Concentrations for 10 Minutes at pH 7.0 and at 20°-25°C.

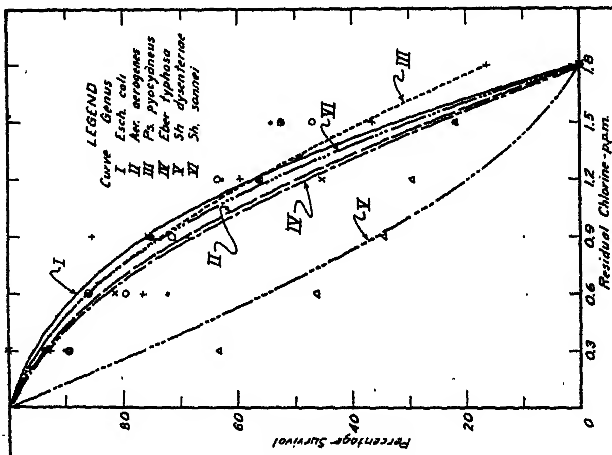

FIG. IV-B Relative Survival of Five Genera of Bacteria Exposed to Chloramine in Various Concentrations for 10 Minutes at pH 8.5 and 20°-25°C.

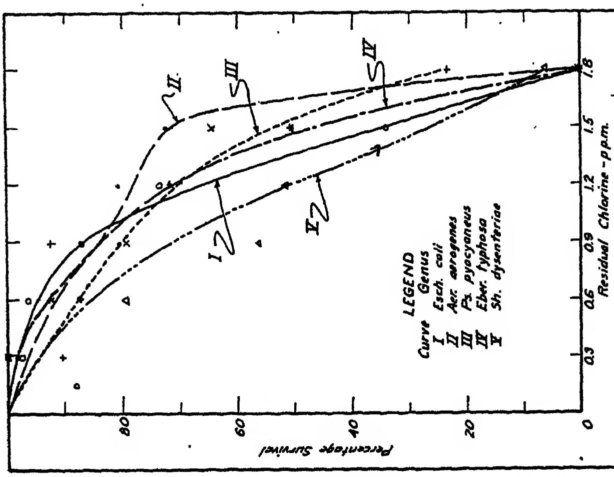

FIG. IV-C Relative Survival of Five Genera of Bacteria Exposed to Chloramine in Various Concentrations for 10 Minutes at pH 9.5 and 20°-25°C.

sions of test bacteria were added, was made the standard procedure for the routine tests of this study. This procedure was adopted to make sure that the chloramine-formation reaction was complete before the bacteria were added, i. e., to insure that all bactericidal action observed could be attributed to chloramines and not to free chlorine. Such a procedure was not in accord with the conditions observed in normal practice where the bacteria, and usually the ammonia nitrogen, are in the water before the chlorine is added. The procedure followed in our routine studies would be duplicated in normal practice only when extraneous pollution was introduced into the finished water, either in the clear well or in the distribution system.

These considerations introduced questions concerning (*a*) the validity of the practical application of the results of this study, and (*b*) the relative bactericidal efficiency of chloramines as freshly formed and after prolonged storage in water as occurs in a distribution system. To obtain information on these points 42 series of tests at 20° to 25° C. were made with *Esch. coli* in waters at pH 7.0, 8.5, and 9.5 when the contact periods for chlorine and ammonia nitrogen, before the addition of the test bacteria, were varied as follows: (*a*) Zero contact, i. e., the bacteria and the ammonia nitrogen were added to the water first and then, after mixing, the chlorine was introduced; (*b*) 1-hour contact, (*c*) 20-hour contact; and (*d*) 68-hour contact.

A careful study of the results indicates very little difference in the bactericidal action under the four conditions if contributing factors are considered. With zero contact time the average extent of bacterial kill was approximately 10 percent greater. However, this was not the case in all instances. Apparently the reaction between chlorine and ammonia nitrogen occurs almost instantaneously, as has been indicated by Moore, et al. (*3*) so that little opportunity was offered under this condition for free chlorine to act as such. The extent of the bacterial kills in waters of 20-hour contact was slightly lower than that of the 1-hour, and after 68 hours, still lesser kills were observed, when judged on a basis of the initial chloramine concentrations. It should be noted, however, that after 20 hours' storage the chloramine residuals were slightly reduced before the bacteria were added, and after 68 hours a considerable reduction (15–25 percent) had occurred. Consequently, if the percentage of bacterial kill results was set back so that the extent of kills was based on equivalent residuals at the time the bacteria were exposed, approximately the same efficiencies were observed under all the conditions.

TIME REQUIRED TO PRODUCE A 100-PERCENT KILL

Data compiled from the preceding tables are presented in table 9 showing the time required to produce a 100-percent kill of the several genera of bacteria studied, when exposed to chloramine at the various hydrogen-ion concentrations and temperatures used. Sections of these data from table 9 have been plotted to illustrate certain factors. For instance, in figure 5A the time required to produce a 100-percent kill of *Esch. coli* exposed to chloramine in various concentrations at six pH values at room temperature is shown, and in figure 5B similar data for three genera of bacteria obtained at one pH, 8.5, and at two temperatures, 2° to 6° C. and 20° to 25° C., are presented. Additional data could not be shown in these figures without confusion. If desired, similar figures may be prepared, illustrating the various genera studied and the other conditions of pH and temperature. The *sonnei* strains were selected to represent the *Shigella* genus as they were the most resistant of the six *Shigella* species tested.

It is noted from Figure 5A and the results in table 9 that, in general, as the pH was increased, longer periods of time were required to produce a 100-percent kill if the residual chlorine was the same, or greatly increased amounts of chlorine must be used to obtain 100-percent kills in the same time interval. Thus at 2° to 6° C., the average time required to produce a 100-percent kill of *Esch. coli* with chlorine residuals in the range of 0.9 to 1.5 p. p. m. was 90 minutes at pH 7.0, 360 minutes at pH 8.5, and 1,440 minutes at pH 9.5, respectively. This constituted approximately a fourfold increase in the time required for each pH shift studied, 7.0 to 8.5 and 8.5 to 9.5. At room temperature, 20° to 25° C., the increases in time required were not so great, being about 3.0 times for the pH range 7.0 to 8.5, and 1.8 times for 8.5 to 9.5, with an initial requirement of 20–25 minutes for a 100-percent kill at pH 7.0 with a residual of 1.2 p. p. m. Similarly, to obtain a 100-percent kill in the same interval of time of exposure required, when the pH was shifted from 7.0 to 8.5, an increase in residual chlorine of 1.5–3.0 times (avg. 2.3), and a further change from pH 8.5 to 9.5 required an additional 1.3-fold increase in chlorine dosage. One exception to these generalizations is noted: At pH 9.5 with a chlorine residual of 1.8 p. p. m. the 100-percent kill was observed in 5 minutes, whereas a longer time, 20 minutes, was required for this chlorine concentration at pH 7.8 and 8.5.

Comparing the results obtained with the three genera at 20° to 25° C., as given in figure 5B and in table 9, it is noted that *S. sonnei* was slightly more sensitive than *Esch. coli* with the smallest and largest amounts of chlorine used. With the other four intermediate chlorine concentrations, 0.6, 0.9, 1.2, and 1.5 p. p. m., *S. sonnei* was slightly more resistant. A similar variation at other concentrations

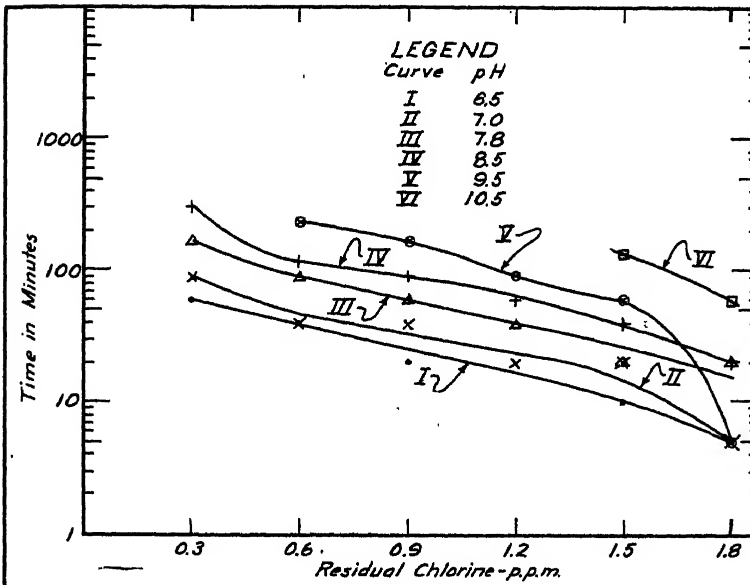

FIG. V-A
Time Required to Produce 100 Percent Kill of Esch. coli when Exposed to Chloramine in Various Concentrations at Various pH Values and at 20°-25°C.

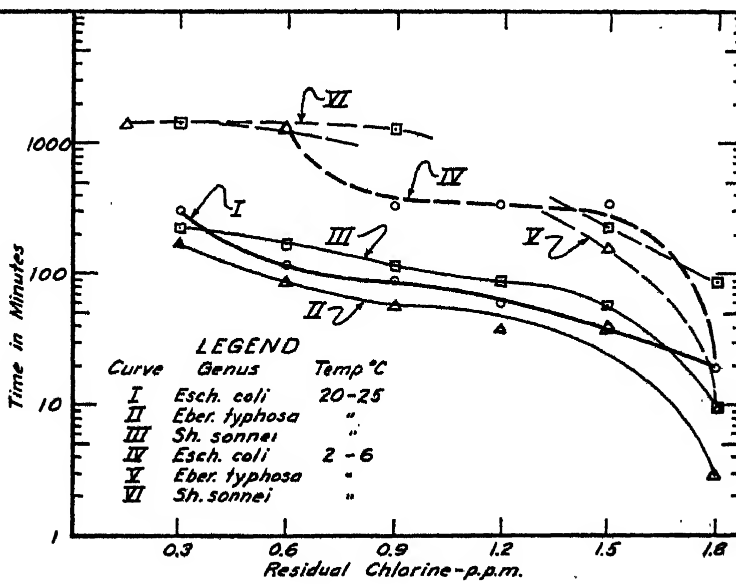

FIG. V-B
Time Required to Produce 100 Per Cent Kill of Various Genera of Bacteria when Exposed to Chloramine in Various Concentrations at pH 8.5 and at Two Temperature Ranges.

may be noted for the results obtained at 2° to 6° C. At this temperature, however, the differences were very slight, possibly within the limits of experimental error, with *sonnei* again appearing to be more resistant.

In this connection it is noted that if the results for *A. aerogenes* (table 9) had been used in figure 5B, the sonnei strains would have been more resistant only with the 1.8 p. p. m. concentration. This favors the retention of aerogenes strains as members of the bacterial criteria of water quality.

RELATIVE EFFICIENCY OF FREE CHLORINE AND CHLORAMINE

Although this report presents data on the bactericidal action of chloramines only, preceding reports in this series, (*1*) and (*5*), have presented rather extensive data on (*a*) the influence of pH and temperature on the survival of coliforms and enteric pathogens exposed to free chlorine, and (*b*) a special study of the relative resistance of *Esch. coli* and *Eber. typhosa* to free chlorine and chloramines. Consequently, it seems appropriate at this point to contrast briefly the relative bactericidal efficiencies of free chlorine and chloramine for the several genera of bacteria studied under comparable conditions, utilizing for this purpose not only the data presented at this time but also the data which have been given in the two preceding reports.

Using *Esch. coli* as the test organism, a comparison of the bactericidal efficiency of free chlorine and chloramine under the same conditions indicates that to obtain (*a*) a 100-percent kill during the same time interval requires about 25 times as much chloramine as free chlorine, and (*b*), a 100-percent kill with the same amount of residual chlorine (as measured by O. T.) requires about 60 to 144 times (avg. 94) longer exposure to chloramine. To illustrate, in waters at pH 8.5 and 2° to 6° C., 100-percent kills of *Esch. coli* were obtained in 20 minutes, with a residual of 0.065 p. p. m. using free chlorine, or 1.8 p. p. m. using chloramine, and at the same pH and at 20° to 25° C., in 60 minutes with 0.05 p. p. m. of free chlorine or 1.2 p. p. m. of chloramine. When similar comparisons, using the same amounts of free chlorine and chloramine, were made in waters at pH 9.5, kills of *Esch. coli* of 100 percent were produced at 2° to 6° C., by 0.9 p. p. m. of free chlorine or chloramine in 10 and 1,440 minutes, and at 20° to 25° C. in the same manner, 0.9 p. p. m. required only 3 and 180 minutes respectively. Because of the wide variations in the relative efficiency of free chlorine and chloramine, it was possible to make these comparisons only in waters at pH 8.5 and 9.5 where the bactericidal action of both is retarded enough to provide for reliable observations and comparisons.

When like comparisons were made using results obtained with *Eber. typhosa* as the test organism, about 15 times as much chloramine

as free chlorine was required to obtain 100-percent kills in the same time interval, and an average of 110 times longer periods of exposure with chloramine if the same O. T. residuals were used. These results are in fair agreement for the ratios given for *Esch. coli* with an indication that *Eber. typhosa* organisms are slightly more susceptible to chloramine, or perhaps less susceptible to free chlorine, than *Esch. coli*. Other comparisons to fit the particular needs of the reader may be made by selecting appropriate data from the tables of these three reports.

SUMMARY

Supplementing previous reports providing data on the bactericidal efficiency of free chlorine for coliforms and enteric pathogens, similar results demonstrating the bactericidal properties of the chloramines are now presented. The results represent the averages from 193 series of experiments conducted at (*a*) pH 6.5, 7.0, 7.8, 8.5, 9.5, and 10.5; (*b*) two temperature ranges, 2° to 6° C. and 20° to 25° C.; (*c*) various ratios of chlorine and ammonia nitrogen, and with species of *Escherichia*, *Aerobacter*, *Pseudomonas*, *Eberthella*, and *Shigella*. The materials and procedures used are fully described and the factors concerned in the use of chloramine are briefly discussed.

The results suggest the following conclusions:

1. The length of the time of exposure of the bacteria in water to chloramine and the amount of chloramine present are primary factors governing the rate of bacterial kills. Under favorable conditions, i. e., at pH 7.0 and a temperature of 20° to 25° C., 100-percent kills cannot be expected in less than 20 minutes with chloramine residuals of about 1.2 p. p. m.

2. The hydrogen-ion concentration has a pronounced effect on the bactericidal activity of chloramine, the activity being diminished with each decrease in hydrogen-ion concentration. For instance, if under given conditions at room temperature, 0.6 p. p. m. of chloramine at pH 7.0 produced a 100-percent kill in 40 minutes, then at pH 8.5, under otherwise identical conditions, approximately 120 minutes would be required, and at pH 9.5, 240 minutes, or to produce a 100-percent kill in 40 minutes at pH 8.5, the chloramine residual would need to be increased to about 1.5 p. p. m.

3. A lowering of temperature retards the bactericidal activity of chloramine. A reduction of 20 degrees in temperature (20°–25° C. to 2°–6° C.) requires 9 times the exposure period, or 2.5 times as much chloramine to produce a 100-percent kill. Thus, when the effect of a high pH water is superimposed on the effect of low temperatures, very marked retardation of bactericidal activity must be anticipated.

4. Under certain conditions some strains of *Eber. typhosa* and *S. sonnei* appear to be slightly more resistant than some strains of *Esch. coli.* However, they were not found any more resistant than the strains of *A. aerogenes* studied.

5. The presence of excessive amounts of ammonia nitrogen (Cl_2:N ratios to 1:25) did not markedly reduce the bactericidal efficiency of the resultant chloramines.

6. The duration of the contact time (0 to 68 hours), of the chloramine components, chlorine and ammonia, did not alter the bactericidal properties of the chloramine.

7. Chloramines are much less efficient as bactericidal agents than free chlorine. Thus, to obtain a 100-percent kill with the same period of exposure required about 25 times as much chloramine as free chlorine, and to obtain the same kill with the same amounts of chlorine and chloramine under the same conditions required approximately 100 times the exposure period for the chloramine.

REFERENCES

(*1*) Butterfield, C. T.; Wattie, Elsie; Megregian, S.; and Chambers, C. W.: Influence of pH and temperature on the survival of coliforms and enteric pathogens when exposed to free chlorine. Pub. Health Rep., **59**: 1837 (1943). Reprint No. 2530.

(*2*) Weber, Geo. R., and Levine, Max: Factors affecting germicidal efficiency of chlorine and chloramine. Am. J. Pub. Health, **34**: 719 (1944).

(*3*) Moore, W. A.: Megregian, S.; and Ruchhoft, C. C.: Some chemical aspects of the ammonia-chlorine treatment of water. J. Am. Water Works Assoc., **35**: 1929 (1943).

(*4*) Moore, W. A.: Use of p-aminodimethylaniline as an indicator for free chlorine. J. Am. Water Works Assoc., **35**: 427 (1943).

(*5*) Wattie, Elsie, and Butterfield, C. T.: Relative resistance of *Escherichia coli* and *Eberthella typhosa* to chlorine and chloramines. Pub. Health Rep., **59**: 1661 (1944). Reprint No. 2593.

INCIDENCE OF HOSPITALIZATION, DECEMBER 1945

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover hospital service plans scattered throughout the country, mostly in large cities.

Item	December	
	1944	1945
1. Number of plans supplying data	77	81
2. Number of persons eligible for hospital care	15,924,479	18,915,067
3. Number of persons admitted for hospital care	114,320	145,954
4. Incidence per 100 persons, annual rate, during current month (daily rate × 365)	84.7	90.8
5. Incidence per 1,000 persons, annual rate, for the 12 months ended December 31, 1945	103.2	106.7
6. Number of plans reporting on hospital days	22	27
7. Days of hospital care per case discharged during month [1]	7.96	8.98

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED JANUARY 12, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 12, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	11,668	9,912
Average for 3 prior years	10,642	
Total deaths, first 2 weeks of year	23,596	19,698
Deaths under 1 year of age	620	661
Average for 3 prior years	699	
Deaths under 1 year of age, first 2 weeks of year	1,264	1,253
Data from industrial insurance companies:		
Policies in force	67,121,498	66,922,444
Number of death claims	13,283	14,780
Death claims per 1,000 policies in force, annual rate	10.3	11.5
Death claims per 1,000 policies, first 2 weeks of year, annual rate	10.3	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 19, 1946

Summary

The incidence of influenza decreased in all geographic sections of the country except the West North Central. A total of 21,110 cases was reported, as compared with 32,635 last week, 3,993 and 47,143, respectively, for the corresponding weeks of 1945 and 1944, and a 5-year (1941–45) median of 4,387. Of the 13 States reporting more than 195 cases each, only two reported increases—Kansas, from 253 to 818, and Oklahoma, 1,768 to 2,164. The other 11 States reported an aggregate of 16,646 cases, as compared with 27,345 for the preceding week. The total for the year to date is 101,786, as compared with 12,712 and 239,498, respectively, for the corresponding periods of 1945 and 1944. The total for the period November 11, 1945, to January 19, 1946, is 444,500, as compared with 566,444 for the corresponding period of 1943–44.

Cumulative figures for the year to date for diphtheria and poliomyelitis are above those for both the corresponding period of last year and the 5-year median, while those for meningococcus meningitis, scarlet fever, smallpox, typhoid fever, and whooping cough are below. The figure for measles, 13,573, is above that for the same period of last year, but below the 5-year median, 25,839.

Of 13 cases of smallpox reported during the week, 8 occurred in Idaho.

A total of 10,401 deaths was recorded during the week in 93 large cities of the United States, as compared with 11,670 last week, 9,656 and 10,461 for the corresponding weeks of 1945 and 1944, respectively and a 3-year (1943–45) average of 10,091. The total to date is 33,999, as compared with 29,354 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Jan. 19, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945	
NEW ENGLAND												
Maine	1	0	0	2	-------	5	5	6	29	0	2	2
New Hampshire	0	0	0	-------	-------	-------	7	-------	6	0	0	0
Vermont	2	0	0	77	-------	-------	12	2	28	0	0	0
Massachusetts	6	3	3	-------	-------	-------	209	43	364	10	2	2
Rhode Island	0	0	0	2	-------	1	-------	-------	17	1	1	1
Connecticut	2	2	2	22	3	8	39	46	65	1	2	2
MIDDLE ATLANTIC												
New York	18	12	18	[1] 43	[1] 3	[1] 15	573	118	719	26	27	27
New Jersey	1	5	8	56	2	18	55	15	478	9	6	6
Pennsylvania	25	6	10	16	4	4	656	52	1,214	18	12	12
EAST NORTH CENTRAL												
Ohio	30	11	8	35	8	29	18	5	96	13	5	5
Indiana	17	4	8	76	13	16	61	23	67	2	7	7
Illinois	4	1	13	22	5	34	438	51	177	13	16	8
Michigan [2]	18	19	14	18	1	5	430	31	176	5	5	5
Wisconsin	1	3	3	196	8	101	60	23	421	4	3	1
WEST NORTH CENTRAL												
Minnesota	8	11	1	3	-------	2	7	16	16	3	2	2
Iowa	6	3	3	-------	-------	15	329	39	95	0	1	1
Missouri	8	4	7	33	4	12	113	8	45	9	18	5
North Dakota	6	3	2	28	3	41	-------	2	19	2	0	1
South Dakota	0	0	2	-------	-------	-------	33	7	11	0	0	0
Nebraska	2	1	1	61	4	51	13	4	10	2	3	1
Kansas	8	2	2	818	2	17	187	12	135	1	5	5
SOUTH ATLANTIC												
Delaware	0	0	1	-------	-------	-------	4	6	7	0	1	1
Maryland [2]	26	12	5	26	14	27	33	15	19	2	4	4
District of Columbia	0	0	2	3	2	6	10	2	17	0	2	2
Virginia	23	5	8	1,835	278	763	172	24	194	11	8	8
West Virginia	4	4	4	488	8	38	25	18	58	8	3	3
North Carolina	21	12	17	-------	-------	31	23	14	169	3	7	7
South Carolina	6	4	7	1,811	775	775	53	4	70	1	1	1
Georgia	8	7	7	170	59	101	41	4	64	3	6	2
Florida	9	7	7	8	4	13	21	26	26	3	5	3
EAST SOUTH CENTRAL												
Kentucky	6	7	6	72	3	21	226	5	38	6	5	3
Tennessee	17	6	6	187	57	81	50	48	49	14	4	4
Alabama	4	6	10	2,164	175	433	11	21	72	4	8	4
Mississippi [2]	8	5	5	-------	-------	-------	-------	-------	-------	3	6	3
WEST SOUTH CENTRAL												
Arkansas	15	11	10	490	143	186	38	12	61	8	4	1
Louisiana	11	6	7	2,253	3	8	5	11	18	6	4	4
Oklahoma	3	8	9	461	126	138	20	19	19	3	3	2
Texas	30	71	58	6,437	2,094	2,004	215	111	111	10	11	10
MOUNTAIN												
Montana	1	1	1	102	35	35	13	2	54	1	0	0
Idaho	2	0	0	105	2	2	69	4	4	1	0	0
Wyoming	0	0	0	-------	-------	70	10	3	10	1	0	0
Colorado	4	0	6	93	11	77	109	15	158	0	1	0
New Mexico	3	4	3	86	6	6	-------	10	15	1	1	0
Arizona	4	4	2	356	97	103	4	8	64	0	2	0
Utah [2]	0	0	0	1,976	4	105	52	32	32	2	0	0
Nevada	0	0	0	-------	-------	-------	40	1	1	0	1	0
PACIFIC												
Washington	9	2	2	-------	1	12	296	50	60	3	2	2
Oregon	6	10	1	136	12	53	35	72	102	7	0	0
California	35	32	20	343	24	112	670	387	273	20	16	16
Total	427	314	314	21,110	3,993	4,387	5,490	1,427	9,234	240	222	222
3 weeks	1,320	1,053	1,014	101,786	12,712	12,712	13,573	3,861	25,839	691	711	711

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Jan. 19, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945		Jan. 19, 1946	Jan. 20, 1945	
NEW ENGLAND												
Maine	0	1	0	19	58	26	0	0	0	0	1	0
New Hampshire	0	0	0	3	15	12	0	0	0	0	0	0
Vermont	1	1	0	13	1	7	0	0	0	0	0	0
Massachusetts	0	0	0	173	328	328	0	0	0	2	0	1
Rhode Island	0	0	0	11	15	15	0	0	0	0	0	0
Connecticut	2	0	0	34	63	63	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	4	5	2	297	576	385	0	0	0	0	2	4
New Jersey	3	0	1	87	107	112	0	0	0	3	3	0
Pennsylvania	1	0	0	137	331	285	0	0	0	1	4	4
EAST NORTH CENTRAL												
Ohio	0	0	1	228	237	311	1	0	0	2	1	2
Indiana	1	0	0	89	132	115	0	1	2	0	2	2
Illinois	1	3	2	159	334	265	0	0	1	1	0	2
Michigan [2]	0	0	0	145	236	195	0	0	0	1	0	1
Wisconsin	0	1	1	123	175	175	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	1	0	52	95	95	0	0	0	0	0	0
Iowa	4	0	0	42	106	63	0	0	0	4	0	1
Missouri	1	1	1	41	121	86	0	0	1	0	1	1
North Dakota	0	0	0	9	36	36	0	0	0	0	0	0
South Dakota	0	1	0	15	33	31	0	0	0	0	1	0
Nebraska	0	0	0	55	60	38	0	0	1	0	0	0
Kansas	1	0	0	71	142	94	0	0	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	1	12	14	0	0	0	0	0	0
Maryland [2]	0	1	0	56	142	68	0	0	0	2	1	1
District of Columbia	0	0	0	12	59	28	0	0	0	0	0	0
Virginia	1	0	0	72	86	48	0	0	0	0	1	2
West Virginia	0	0	0	34	65	64	0	0	0	0	5	1
North Carolina	0	1	1	33	72	66	0	1	0	4	0	0
South Carolina	0	0	0	10	7	11	0	0	0	0	1	1
Georgia	0	1	0	7	45	24	0	0	0	2	1	2
Florida	1	0	0	5	5	5	0	0	0	1	2	1
EAST SOUTH CENTRAL												
Kentucky	0	0	0	35	50	56	0	0	0	1	0	1
Tennessee	0	0	1	50	62	88	0	1	0	1	0	2
Alabama	0	1	1	9	17	23	0	0	0	0	0	0
Mississippi [2]	2	0	0	13	30	13	0	1	1	1	1	0
WEST SOUTH CENTRAL												
Arkansas	2	1	0	14	23	9	1	1	0	0	0	0
Louisiana	6	0	2	11	15	5	1	0	0	4	2	7
Oklahoma	0	1	0	25	31	26	1	0	0	3	1	2
Texas	3	1	1	103	181	82	0	0	1	3	11	6
MOUNTAIN												
Montana	2	0	0	2	14	20	0	0	0	2	0	0
Idaho	0	0	0	10	64	15	8	2	0	2	2	0
Wyoming	0	0	0	6	7	7	0	0	0	0	0	0
Colorado	0	0	0	51	82	38	1	0	0	0	1	1
New Mexico	1	0	0	17	47	6	0	0	0	1	1	1
Arizona	0	1	0	2	20	8	0	2	0	4	2	1
Utah [2]	1	0	1	43	45	45	0	0	0	0	0	0
Nevada	0	0	0	0	1	0	0	0	0	0	0	0
PACIFIC												
Washington	2	2	2	57	81	38	0	0	0	0	3	2
Oregon	1	0	0	24	43	19	0	0	0	0	0	1
California	10	3	1	206	431	194	0	0	0	2	1	2
Total	51	27	27	2,711	4,938	3,981	13	9	20	48	51	61
3 weeks	152	111	103	7,816	13,849	10,749	22	30	41	129	132	174

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately as follows: Massachusetts 2; Connecticut 1; Maryland 1; Georgia 1; Texas 1.

Telegraphic morbidity reports from State health officers for the week ended Jan. 19, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Jan. 19, 1946	Whooping cough: Week ended— Jan. 20, 1945	Whooping cough: Median 1941–45	Week ended Jan. 19, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	16	41	41								
New Hampshire	12	10	2								
Vermont	12	47	34								2
Massachusetts	111	91	206	2	2						
Rhode Island	69	25	25								
Connecticut	42	54	54								3
MIDDLE ATLANTIC											
New York	258	239	451	6	1		2		1		5
New Jersey	164	94	140			1			1		1
Pennsylvania	141	220	330								
EAST NORTH CENTRAL											
Ohio	92	134	208		2		1				1
Indiana	24	14	16				1		1		
Illinois	82	100	133						4		6
Michigan [3]	129	75	349		7						5
Wisconsin	71	98	115				1				2
WEST NORTH CENTRAL											
Minnesota	10	43	43	3							2
Iowa	7	10	28	1							
Missouri	6		9			1					1
North Dakota		8	8								
South Dakota	1	2	5								
Nebraska	5	1	9								
Kansas	14	45	45				1				2
SOUTH ATLANTIC											
Delaware		1	1								
Maryland [3]	12	60	60			1					1
District of Columbia	10	6	14								
Virginia	70	46	89	2		32			7		1
West Virginia	14	29	59								
North Carolina	58	135	146						3	3	
South Carolina	53	82	60		6				1	4	
Georgia	6	15	16		1				2	11	7
Florida	14	17	20							4	2
EAST SOUTH CENTRAL											
Kentucky	11	33	33	2					3		
Tennessee	20	7	33						4	3	
Alabama	7	13	15	1						5	
Mississippi [3]									1		
WEST SOUTH CENTRAL											
Arkansas	3	41	24	23	3				2	2	
Louisiana			3	2					5	2	
Oklahoma	6	10	13			1					
Texas	146	193	140	22	274	108				14	33
MOUNTAIN											
Montana	2	25	16								
Idaho	4	7	7				1				
Wyoming		5	5								
Colorado	32	14	33	1							
New Mexico	12	11	12				1				
Arizona	14	19	24			29					
Utah [3]	15	7	30								
Nevada	7		1								
PACIFIC											
Washington	61	31	47								2
Oregon	10	9	10								1
California	123	251	251	2	13					1	1
Total	1,976	2,418	4,135	67	309	173	8	0	35	49	78
Same week, 1945	2,418			42	658	83	4	1	37	74	76
Average, 1943–45	2,825			30	325	48	7	[4] 0	21	[4] 51	
3 weeks: 1946	5,504			135	1,164	436	21	0	87	191	194
1945	6,526			89	2,230	557	17	1	119	243	200
Average, 1943–45	7,871		[4] 12,037	77	1,152	271	24	[4] 1	77	[4] 172	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

Leprosy: California, 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 12, 1946

This table lists the reports from 86 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	1	------	0	1	0	1	0	6	0	0	13
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	4	0	------	2	17	1	40	0	45	0	1	19
Fall River	0	0	------	0	------	1	0	0	5	0	0	5
Springfield	0	0	------	0	3	0	1	0	16	0	0	6
Worcester	0	0	------	0	12	1	19	0	12	0	0	13
Rhode Island:												
Providence	0	0	5	0	1	0	7	0	8	0	0	65
Connecticut:												
Bridgeport	0	0	1	0	1	1	6	0	1	0	0	------
Hartford	0	0	------	0	------	1	2	0	4	0	0	5
New Haven	0	0	2	1	------	0	3	0	0	0	0	6
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	1	3	13	4	4	0	8	0	0	54
New York	8	1	44	4	156	14	150	3	161	0	0	64
Rochester	0	0	------	1	3	0	5	0	7	0	2	5
Syracuse	0	0	------	0	410	2	3	0	8	0	0	8
New Jersey:												
Camden	0	0	------	0	1	0	3	0	4	0	0	5
Newark	0	0	3	0	5	1	10	0	11	0	0	25
Trenton	0	0	3	1	0	0	3	0	2	0	0	------
Pennsylvania:												
Philadelphia	2	0	15	8	169	2	41	0	44	0	0	38
Pittsburgh	3	0	5	4	2	2	19	0	8	0	0	5
Reading	0	0	1	4	1	0	5	0	1	0	0	17
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	5	0	------	3	17	0	7	0	0	2
Cleveland	1	0	4	3	2	6	20	0	20	0	0	23
Columbus	5	0	4	4	3	0	6	0	9	0	0	1
Indiana:												
Fort Wayne	0	0	------	1	2	0	3	0	0	0	0	------
Indianapolis	2	0	------	0	25	0	8	0	16	0	0	6
South Bend	0	0	------	0	------	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	1	0	4	0	1	0	0	------
Illinois:												
Chicago	0	0	11	3	407	18	62	0	60	0	0	38
Springfield	0	0	------	1	2	0	6	0	3	0	0	2
Michigan:												
Detroit	3	1	5	4	145	1	11	0	41	0	0	44
Flint	0	0	------	0	34	0	3	0	4	0	0	------
Grand Rapids	0	0	------	1	6	0	3	0	6	0	0	5
Wisconsin:												
Kenosha	0	0	------	0	------	0	0	0	1	0	0	------
Milwaukee	0	0	------	0	24	1	13	0	22	0	0	13
Racine	0	0	------	3	1	1	0	0	1	0	0	2
Superior	0	0	------	0	1	0	0	0	0	0	0	11
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	1	------	0	2	0	9	0	0	2
Minneapolis	1	0	------	0	1	1	8	0	15	0	0	2
Missouri:												
Kansas City	0	0	2	1	48	0	14	0	11	0	0	2
St. Joseph	0	0	------	0	37	0	0	0	2	0	0	------
St. Louis	3	0	23	4	19	2	11	0	17	0	1	4

City reports for week ended January 12, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	4	0	------	0	5	0	4	0	5	0	0	------
Kansas:												
Topeka	1	0	------	0	10	1	1	0	5	0	0	------
Wichita	0	0	1	0	7	0	1	0	3	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	1	0	9	0	1	0	0	------
Maryland:												
Baltimore	22	0	23	4	13	0	25	0	25	0	0	26
Cumberland	0	1	------	0	------	0	1	0	0	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	2	0	8	0	7	0	14	0	1	9
Virginia:												
Lynchburg	0	0	------	1	------	0	1	0	2	0	0	------
Richmond	1	0	5	4	1	4	7	0	9	0	1	3
Roanoke	0	0	------	0	------	0	0	0	1	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	------	0	0	0	1	0	0	1
North Carolina:												
Raleigh	0	0	------	0	------	0	6	0	0	0	0	------
South Carolina:												
Charleston	0	0	115	0	------	0	2	0	4	0	0	------
Georgia:												
Atlanta	0	0	51	3	------	0	7	0	0	0	0	3
Brunswick	0	0	------	0	------	0	0	0	0	0	0	------
Savannah	0	0	12	3	------	0	2	0	2	0	0	------
Florida:												
Tampa	0	0	1	0	20	0	5	0	1	0	1	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	7	6	12	3	24	0	13	0	0	8
Nashville	0	0	------	2	28	2	2	0	0	0	0	1
Alabama:												
Birmingham	0	0	89	4	------	2	8	1	6	0	0	------
Mobile	1	0	66	3	------	1	6	0	2	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	5	0	1	0	2	0	0	0	0	------
Louisiana:												
New Orleans	2	0	9	1	------	5	11	0	5	0	4	------
Shreveport	0	0	------	0	------	0	3	0	1	0	0	------
Texas:												
Dallas	4	0	1	3	1	1	6	0	8	0	0	------
Galveston	0	0	------	0	------	0	1	0	1	0	0	------
Houston	1	0	------	0	1	2	3	0	4	0	1	------
San Antonio	3	0	6	5	2	0	11	0	2	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	1	------	0	1	0	0	0	0	------
Great Falls	0	0	------	0	------	0	1	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	1	0	0	------
Missoula	0	0	50	0	------	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	1	0	1	0	0	0	0	0	0	------
Colorado:												
Denver	1	0	12	0	14	0	13	0	8	0	0	15
Pueblo	0	0	------	0	------	0	2	0	8	0	0	------
Utah:												
Salt Lake City	0	0	------	0	9	0	0	1	7	0	0	------

City reports for week ended January 12, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	1	0	------	1	69	1	3	0	4	0	0	13
Spokane	0	0	4	0	41	0	2	0	3	0	0	7
Tacoma	0	0	------	2	31	0	1	0	3	0	0	12
California:												
Los Angeles	1	0	85	7	36	4	10	4	31	0	1	10
Sacramento	1	0	2	1	24	0	2	0	3	0	0	1
San Francisco	1	0	17	0	161	2	10	0	12	0	0	4
Total	78	4	698	105	2,049	91	713	9	789	0	13	625
Corresponding week, 1945	61	------	145	36	352	------	478	------	1,492	0	13	687
Average, 1941-45	70	------	2,467	[1] 122	[2] 2,326	------	[1] 661	------	1,150	2	12	831

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Dysentery, amebic.—Cases: Rochester 1; Cleveland 1.
Dysentery, bacillary.—Cases: Bridgeport 1; Detroit 3; Los Angeles 4.
Dysentrey, unspecified.—Cases: San Antonio 7.
Tularemia.—Cases: Memphis 1.
Typhus fever, endemic.—Cases: Birmingham 1; Mobile 7; Little Rock 1; New Orleans 3; San Antonio 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1943, 33,969,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles, case rates	Meningitis, meningococcus case rates	Pneumonia, death rates	Poliomyelitis, case rates	Scarlet fever, case rates	Smallpox, case rates	Typhoid and paratyphoid fever, case rates	Whooping cough, case rates
New England	10.5	2.6	20.9	7.8	91	13.1	206.5	0.0	256	0.0	2.6	345
Middle Atlantic	6.0	0.5	33.3	11.6	352	11.6	112.5	1.4	118	0.0	0.9	102
East North Central	7.3	0.6	17.6	12.2	397	18.2	94.9	0.0	117	0.0	0.0	89
West North Central	20.3	0.0	58.6	13.5	286	9.0	92.4	0.0	151	0.0	2.3	27
South Atlantic	39.0	1.7	354.6	25.4	73	6.8	122.1	0.0	102	0.0	5.1	71
East South Central	11.8	0.0	956.1	88.5	236	47.2	236.1	5.9	124	0.0	0.0	53
West South Central	28.7	0.0	60.3	25.8	14	23.0	106.2	0.0	60	0.0	14.3	0
Mountain	7.9	0.0	500.4	7.9	191	0.0	135.0	7.9	151	0.0	0.0	119
Pacific	6.3	0.0	170.8	17.4	573	11.1	44.3	6.3	89	0.0	1.6	74
Total	12.0	0.6	107.4	16.2	315	14.0	109.7	1.5	121	0.0	2.0	96

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 22, 1945.—During the week ended December 22, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		8		139	305	45	85	99	107	788
Diphtheria		1	6	34	14	3		1	5	64
Dysentery:										
Bacillary				1						1
Unspecified					3					3
German measles				7	25		3	7	7	49
Influenza		6			64	9				79
Measles		2	47	184	357	2	2	18	57	669
Meningitis, meningococcus				1	1					2
Mumps			1	61	75	17	24	62	53	293
Poliomyelitis		2								2
Scarlet fever		6	7	50	88	16	10	21	16	214
Tuberculosis (all forms)		5	4	78	35	17	29	45	41	254
Typhoid and paratyphoid fever				10					1	11
Undulant fever								1	1	2
Venereal diseases:										
Gonorrhea		6	25	76	125	58	58	41	121	510
Syphilis		12	4	95	113	7	8	27	62	328
Whooping cough		25	1	86	31	6		9		158

NEW ZEALAND

Notifiable diseases—4 weeks ended December 1, 1945.—During the 4 weeks ended December 1, 1945, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	20	3	Poliomyelitis	1	
Diphtheria	75	3	Puerperal fever	7	
Dysentery:			Scarlet fever	178	
Amebic	7		Tetanus	2	1
Bacillary	4		Trachoma	3	
Erysipelas	9		Tuberculosis (all forms)	243	70
Food poisoning	85		Typhoid fever	12	2
Malaria	13		Undulant fever	6	
Ophthalmia neonatorum	1				

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

British East Africa—Uganda.—For the week ended January 12, 1946, 5 fatal cases of plague were reported in Uganda, British East Africa.

Madagascar.—Plague has been reported in Madagascar as follows: December 1–10, 1945, 5 cases; December 11–20, 1945, 18 cases.

Smallpox

Sudan (French).—Smallpox has been reported in French Sudan as follows: December 1–10, 1945, 130 cases; December 11–20, 1945, 35 cases; December 21–31, 1945, 307 cases.

Venezuela.—For the month of December 1945, 54 cases of smallpox (alastrim) were reported in Venezuela. States reporting the highest incidence are Miranda 16, and Sucre 12.

Typhus Fever

Belgian Congo.—Typhus fever has been reported in Belgian Congo as follows: Week ended December 22, 1945, 122 cases, 11 deaths; week ended December 29, 1945, 102 cases.

Greece.—For the week ended December 22, 1945, 19 cases of typhus fever were reported in Greece.

Turkey.—For the week ended January 12, 1946, 38 cases of typhus fever were reported in Turkey, including cases reported in ports as follows: Izmir 5, Kocaeli 7, Balikesir 3, Istanbul 6, Zonguldak 1, Trabzon 1, Icel 1, Erzurum 1.

Yellow Fever

Venezuela—Trujillo State.—During the week ended January 12, 1946, 1 confirmed case of yellow fever was reported in the municipality of Sabana Grande, and 1 confirmed case was reported in the municipality of Motatan, both in the State of Trujillo, Venezuela.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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Public Health Reports

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Public Health Reports

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DIPHTHERIA INCIDENCE AND TRENDS IN RELATION TO ARTIFICIAL IMMUNIZATION, WITH SOME COMPARATIVE DATA FOR SCARLET FEVER[1]

By Selwyn D. Collins, *Head Statistician, United States Public Health Service*

CONTENTS

One of the many catastrophies of Europe that did not occur in the United States was a tremendous diphtheria epidemic with a total in 1943 of about 630,000 reported cases in all Europe except Russia. Estimates allowing for incompleteness of reporting and nonreporting countries (except Russia) put the total at a million cases in 1943 and at least that many in 1944 (*29*).

The countries which suffered the greatest increases (*19*) in diphtheria cases were: Norway, where the annual prewar level (median 1928–38)[2] was 968 cases of diphtheria but at the height of the epidemic in 1943, there were 22,787 cases, or 24 times the prewar level. Belgium with a prewar median of 2,089 cases reported 16,072 in 1943, or 7.7 times the expectancy.

The Netherlands, with a median of 3,967 cases in prewar years, reported 56,603 cases in 1943 and 60,226 in 1944, or 14 to 15 times the prewar level in 2 consecutive years. In France the 46,539 cases in the peak year of 1943 and 40,430 in 1944 were 2.3 and 2.0, respectively, times the prewar expectancy of 19,839 cases. Denmark, how-

[1] From the Division of Public Health Methods.

[2] In some countries the mean 1935–39 level of reported cases was considerably below the median 1928–38 which is used in this discussion, but generally the two averages are of the same order of magnitude.

ever, showed only 12 percent increase in its 1944 peak of 3,333 cases over the 1928–38 median of 2,969 cases. England and Wales (except for 50,797 cases in 1941) showed an uninterrupted decrease from a prewar level of 59,319 cases to 29,446 in 1944, or just about half the prewar expectancy.

In Germany the relative increase was not as great as in some of the overrun countries, but the actual numbers of cases were higher, reaching a peak of 244,500 in 1942 for the territory included in prewar Germany, or 3.1 times the prewar level of 78,452 for the same territory. Cases in 1943 were nearly as high, 238,409, or 3.0 times the prewar level.

Southern European countries were not generally affected to the same extent as the northern countries. Austria, Bulgaria, and Hungary, at their 1943 peaks, showed, respectively, only 24, 18, and 4 percent more cases than their medians for 1928–38; Roumania and Turkey showed decreases in 1943 of 55 and 27 percent, respectively, from their prewar levels.

The neutral countries of Sweden and Switzerland also suffered large increases in diphtheria cases. Sweden increased from a 1928–38 median of 1,484 to 6,040 cases in 1944, or 4.1 times the prewar level; cases in Switzerland increased from a median of 2,188 for 1928–38 to 4,211 in 1944, or 1.9 times the prewar level.

In Norway, Sweden, and to a lesser extent in the Netherlands and Switzerland, the reported cases of diphtheria were decreasing rather rapidly so that the level for 1935–39, and particularly for 1938 and 1939, was considerably below the 1928–38 medians used as the prewar level in the above discussion. Stowman (*29*) states that the low incidence in these countries, at least in Norway and the Netherlands, was reached without the aid of extensive artificial immunization and that few countries in Europe were thoroughly immunized, Hungary being the best immunized. He concludes that the reduction of diphtheria toward the vanishing point gives rise to a dangerous situation unless it is accompanied by extensive immunization.

In Great Britain the immunization program was greatly expanded during the war years when children were being relocated in rural areas for protection against bombing. As already noted diphtheria continued to decline in England and Wales throughout the war years but in Norway and the Netherlands, where immunization was not prevalent, there was a tremendous rise in incidence.

TREND OF DIPHTHERIA IN THE UNITED STATES

In the United States as a whole there has been a rapid decline in diphtheria incidence from about 120,500 reported cases in 1924 to 14,150 in 1944, or from 106 cases per 100,000 population to about one-tenth of that figure, 10.7 in 1944. Mortality has declined at a

similar relative rate from 10,035 registered deaths in 1924 to 1,145 in 1944, or from 8.8 per 100,000 to 0.86 in 1944. However, there was some slackening in the relative rates of decline after 1940 and some cities and geographic sections showed an increased incidence in 1944 and particularly 1945, according to provisional data for the latter year. For the country as a whole the excess in reported cases over the median for corresponding months of 1940–44 has increased during 1945 until it amounted to 30 to 45 percent for the last months of the year.

Trends in certain States.—Cases and deaths from diphtheria are available in a few States for exceptionally long periods. The recorded diphtheria death rate in Massachusetts is available back to 1842, in Michigan to 1869, and in New York to 1885. If the Massachusetts mortality records are complete for the early years, which may be doubted, diphtheria was on the increase up to roughly 1880, reaching peaks of nearly 200 deaths per 100,000 total population in 1863 and again in 1876. After this second peak there was a gradual decrease until around 1925, after which the general trend declined at a markedly accelerated rate. The straight line drawn in figure 1 through the fluctuating diphtheria death rates from 1898 to 1924 indicates the approximate trend during the 27-year period just preceding the great acceleration in the decline.

Reported cases during this same quarter-century decreased very little but in 1925 the trend of the case rate began a rapid decline which paralleled that in the death rate. Aside from considerable decline a few years prior to 1900, the recorded case fatality decreased

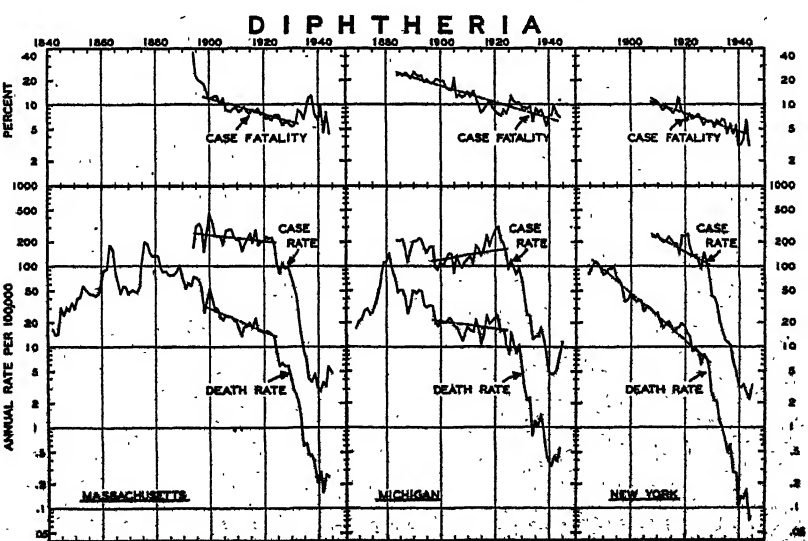

FIGURE 1.—Trend of diphtheria incidence, mortality, and case fatality in three States during 40 to 100 years ending in 1944 for deaths and 1945 (provisional) for cases. (Actual rates per 100,000 total population; deaths recorded by State registrars and cases reported to health departments (26, 27, 28, 30).)

gradually until about 1933 when there was an increase to a maximum in 1938 followed by a decline to the approximate level of 1930. Although the rapid decline in the late nineties came at about the time when antitoxin first became available, it is based on the early years of case reporting and so may be unreliable.

Similar rates for Michigan and New York State are also plotted in figure 1. The data for Michigan are more variable, with an apparent increase in the case rate over a considerable period of years which may be due to better reporting. However, the general picture is the same, with a sharp change in the trend of the incidence and mortality from diphtheria about 1925, but with no marked change in the trend of case fatality.

New York State shows approximately the same history except that (*a*) from about 1890 to the late twenties the decline in the death rate was somewhat greater than in the two other States, and (*b*) there was some downward trend in the case rate during this early period. However, about 1929 there was a sharp break in these trends with a large acceleration in the rate of decline in both cases and deaths, but with no change in the general trend of case fatality.

Thus in these States the diphtheria death rate was declining before antitoxin came into use in the nineties and it continued to decline at a rate not very different from that in the pre-antitoxin period. During the antitoxin period from about 1895 to around 1920 there was a gradual decline in case fatality, as might have been expected with the use of better therapeutic agents. During this period the case rate remained approximately level or declined only slightly, as might have been expected, because antitoxin prevented the death of the patient but except among family contacts was not designed to prevent cases. Although active immunization was first used on humans in 1913, it was not until 1920 to 1925 that it was widely used in the general population; [3] it was in the twenties that a definite change occurred in the trend of the case incidence which was reflected in the mortality but not in case fatality.

It will be profitable to contrast these trends of diphtheria with those shown in figure 2 for scarlet fever. Before the use of the sulfa com-

[3] The Massachusetts Health Department report (*26*) for 1923 states that in 1919 less than 2,000 doses of toxin-antitoxin were distributed by the State health department. In 1920, 3,500 doses were distributed; in 1921, 10,000; in 1922, 95,000; and in 1923, 175,000 doses.

The Michigan Health Department report (*27*) for 1925–26 states that at least 200,000 children or one-fourth of the school population had been immunized against diphtheria in the preceding 2 years.

The New York State Health Department reports (*28*) from 1922 to 1926 mention immunization demonstrations in various cities; the 1926 report states that upwards of 200,000 children had been immunized during the years 1922–26, with more than 100,000 inoculated in 1926 when an organized campaign was carried on.

The New York City Health Department report (*5*) for 1920 mentions research work in Schick testing and active immunization and the setting up of a Schick-test committee. Later reports through 1927 mention the continuation of this work but it appears to be on a fairly small scale. The 1928 report speaks of the establishment of special diphtheria immunization stations and of plans to get the children into these clinics. The Diphtheria Prevention Commission began its work in January 1929. The Health Department report for 1931 states that during the 3 years 1929–31, 522,243 children were immunized.

pounds and other newer therapies (*14, 15, 25*), it was not uncommon to hear the statement that scarlet fever was declining like diphtheria even though nothing had been done about it. A comparison of figures 1 and 2 indicates that the decline in the two diseases was not alike. Although the scarlet fever death rate has been declining for many years, there is little or no break in the general trend of scarlet fever incidence. Thus, since 1920 this disease has not declined like diphtheria, for the decrease in scarlet fever has been due entirely to a declining case fatality. However, in the late thirties there is a definite acceleration in the decrease of the scarlet fever death rate [4], but again

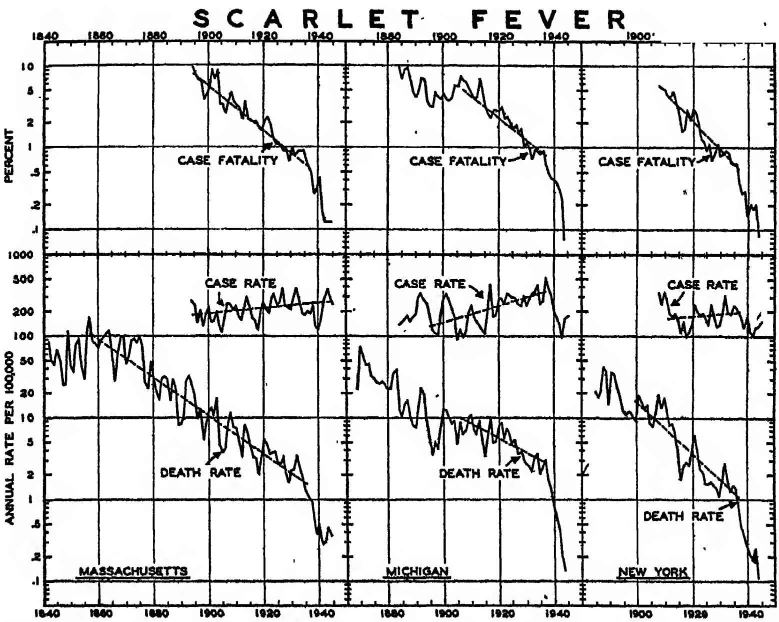

FIGURE 2.—Trend of scarlet fever incidence, mortality, and case fatality in three States during 40 to 100 years ending in 1944 for deaths and 1945 (provisional) for cases. (Actual rates per 100,000 total population; deaths recorded by State registrars and cases reported to health departments (*26, 27, 28, 34*).)

this rapid change in trend is due almost entirely to the change in case fatality. Chapin (*2*) writing in 1926 attributed the downward trend of scarlet fever mortality to a change in the virulence of the causative organism. The rapid decline which comes in the late thirties coincides with the increased use of sulfa in the treatment of scarlet fever and its complications (*25*). Since the newer methods have to do largely with the reduction of case fatality rather than the prevention [5] of cases, no change in the trend of the incidence would be ex-

[4] For the country as a whole deaths credited to scarlet fever decreased from a level of about 2,500 per year in 1933 to 1936 to about 450 per year in 1941 to 1943. The change does not appear to be due to the transfer of deaths to septic sore throat as that cause has also decreased in recent years.

[5] Although methods of immunizing against scarlet fever are available, surveys have indicated that they have not been used on a large enough scale to affect appreciably the trend of the disease (*7, 8*). Recently sulfadiazine has been used in prophylactic doses in the face of an epidemic (*31*).

pected. There is little evidence in figure 2 of any definite change in the trend of scarlet fever incidence although there is some suggestion of it in Michigan and New York.

Trends by geographic section.—The sharp change in the trend of diphtheria incidence and mortality to a definitely accelerated rate of decline at the approximate time when immunization became widely used in the general population suggests that it was an important factor in the change. It will be of interest to examine diphtheria trends in different geographic sections of the country since the extent of immunization varies considerably from State to State. Figure 3 shows trends of the reported incidence and recorded mortality from diphtheria in five geographic sections in the form of three-period moving averages of the actual rates as shown in table 1. Although the first 10 years included in this chart are based on a varying number of States in the different regions, it is believed that they represent at least a rough approximation of the sectional rate. Prior to 1922 case rates in the two northern regions were actually higher than in any other section, and the same is true of death rates prior to 1920. In the decade of the twenties the situation was reversed so that in 1930 the two northern sections and the Pacific coast had lower case rates than the South, and after 1935 had lower case rates than the Mountain region. The same is true of the death rates except that the Mountain section and particularly the South had higher diphtheria rates after 1929. In both case and death rates the Northeast, which was highest prior to 1920, was definitely the lowest after the early thirties.

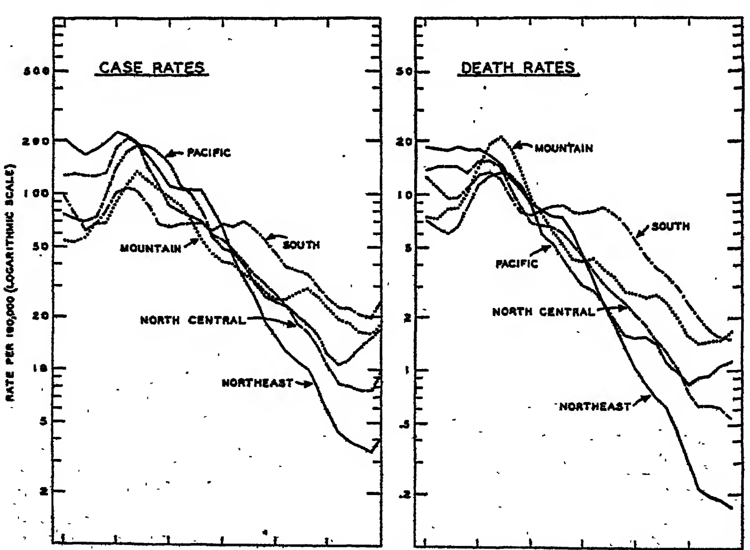

FIGURE 3.—Trend of diphtheria incidence and mortality in five geographic sections of the United States, 1915–44, with provisional case data for 1945. (3-year moving averages of actual rates per 100,000 total population as shown in table 1, with actual rates plotted for 1944 and 1945.)

These trends of rates for whole geographic sections do not show clearly the rather sudden change in the downward trend of diphtheria which appears in figure 1. Aside from the fact that the data plotted in figure 3 are three-period moving averages, the more gradual change in trend is probably due to the less homogeneous character of the situation in the sections involved. Since these regions include both urban and rural populations in parts of the country where doctors are fewer and medical services are less extensive, it is possible that

TABLE 1.—*Trend of diphtheria case and death rates*[1] *per 100,000 total population in the registration States of five geographic sections,*[2] *1914–45*

Year	Northeast		North Central		South		Mountain		Pacific	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
	Annual rate per 100,000 population									
1914	220.9	20.75	144.7	14.95	110.6	13.99	63.3	7.66	72.2	7.10
1915	207.3	18.11	117.3	13.17	97.0	12.20	64.6	7.24	88.9	7.59
1916	178.8	16.64	124.8	13.48	81.0	11.94	35.2	7.58	72.2	6.73
1917	163.7	19.41	148.2	16.66	58.1	8.83	61.8	7.26	60.3	5.21
1918	155.8	17.62	105.5	12.99	44.4	8.13	73.3	9.99	77.5	6.45
1919	218.1	18.98	124.8	13.30	99.9	12.02	67.9	8.23	80.5	8.26
1920	211.4	17.80	163.9	14.31	92.6	13.08	63.1	13.75	134.1	11.10
1921	234.9	17.71	257.5	18.76	116.6	14.32	142.6	22.51	216.2	14.69
1922	185.3	14.87	174.4	14.10	112.9	13.08	124.2	22.66	172.2	12.29
1923	161.1	12.52	146.9	11.84	79.0	9.73	132.8	19.91	182.6	12.78
1924	137.7	10.65	100.7	7.72	64.7	7.14	96.4	11.38	210.4	14.33
1925	108.8	9.04	78.5	6.32	61.4	7.46	95.3	9.30	120.0	6.79
1926	87.5	7.01	79.4	6.97	69.6	8.39	90.9	7.64	116.3	6.19
1927	122.1	8.31	78.2	7.02	72.7	8.62	72.5	7.32	107.2	5.41
1928	104.5	7.81	64.8	5.81	64.8	8.83	51.1	4.25	76.3	4.52
1929	87.6	6.48	63.6	5.80	68.0	8.35	44.2	4.41	50.7	3.39
1930	59.4	4.32	51.4	4.20	54.4	6.72	43.4	4.55	48.0	3.14
1931	43.5	2.84	51.2	3.69	79.0	8.86	35.9	3.82	48.8	2.76
1932	36.2	2.70	42.8	3.39	65.7	8.80	40.4	4.69	42.2	2.79
1933	23.7	1.61	31.6	2.62	67.1	7.89	28.2	2.91	29.3	1.76
1934	18.7	1.38	29.8	2.28	55.0	6.47	26.9	2.82	24.6	1.37
1935	15.4	1.08	31.5	2.42	45.2	5.80	28.6	2.79	25.8	1.71
1936	12.3	.75	19.4	1.64	37.4	4.37	20.8	2.76	23.6	1.64
1937	11.4	.77	17.9	1.48	35.8	3.64	27.5	2.51	19.3	1.42
1938	10.6	.64	18.7	1.40	39.3	3.74	33.6	3.00	19.6	1.24
1939	8.2	.47	13.7	1.00	31.7	3.09	26.1	1.97	15.3	.76
1940	5.2	.29	8.8	.75	19.4	2.17	19.8	1.18	12.5	1.00
1941	4.5	.19	8.7	.59	25.9	1.99	21.6	1.61	9.4	.75
1942	4.0	.17	7.4	.61	23.2	1.84	17.7	1.52	10.2	1.01
1943	3.5	.24	8.0	.73	18.6	1.40	15.0	1.31	14.4	1.12
1944	3.5	.17	7.7	.55	17.3	1.54	16.3	1.68	15.0	1.12
1945	4.0	--------	9.6	--------	24.6	--------	17.9	--------	16.7	--------
	Number of cases and deaths									
1924	43,737	3,381	36,282	2,781	22,761	2,512	[3] 2,914	[3] 398	14,137	963
1934	6,590	486	11,622	887	21,719	2,555	1,049	110	2,176	121
1944	1,183	58	2,998	216	7,458	663	706	73	1,805	135

[1] Rates based on cases reported to the U. S. Public Health Service by State health departments (*34*), and deaths as published by the U. S. Bureau of the Census (*32*), supplemented by State reports (*34*) for years when a State was not in the registration area. Data for 1944 and 1945 are provisional. Populations are intercensal estimates from the U. S. Bureau of the Census; after 1940 they are based on ration book registrations.

[2] Geographic sections are based on census regions as follows: *Northeast:* New England and Middle Atlantic; for cases, 6 to 8 States from 1914 to 1920, and all 9 thereafter; for deaths, all 9 States throughout. *North Central:* East and West North Central; for cases, 7 to 11 States from 1914 to 1921, and all 12 thereafter; for deaths, 9 to 11 States from 1914 to 1917, and all 12 thereafter. *South:* South Atlantic and East and West South Central; for cases, 6 to 16 States from 1914 to 1921, and all 17 thereafter; for deaths, 7 to 16 States from 1914 to 1920, all 17 thereafter except in 1926 and 1927 when Georgia was out of the registration area and figures were not available elsewhere. *Mountain:* For cases, 4 to 7 States from 1914 to 1924, and all 8 thereafter; for deaths, 5 to 7 States from 1914 to 1919, and all 8 thereafter except 1925 to 1928 when New Mexico had rates so far above any other State that it was omitted. *Pacific:* For cases and deaths, all 3 States from 1914 to 1944.

[3] Mountain States include 54 deaths for Utah in 1924, but Utah is not included in the States with case data.

the use of a new procedure like diphtheria imunization would be taken up more gradually than in more urban States like Massachusetts and New York. Also, these rates go back to only 1915 so the period prior to the beginning of immunization is not long.

A comparison of diphtheria mortality for 1939–40 in urban and rural areas combined (table 1) with rates for the same years for cities of 100,000 and over (table 11) indicates less variability from section to section in the rates for large cities. Thus for large cities the death rate for all ages in 1939–40 in the South was 3.6 times that in the Northeast, but for all places, including rural areas, the rate in the South was 6.9 times that in the Northeast. In each of the four regions[6] the rate for large cities was less than that for the section as a whole, the difference being particularly large in the South.

Trends in certain cities.—A few cities have records of diphtheria cases and deaths over long periods. The three large cities with easily

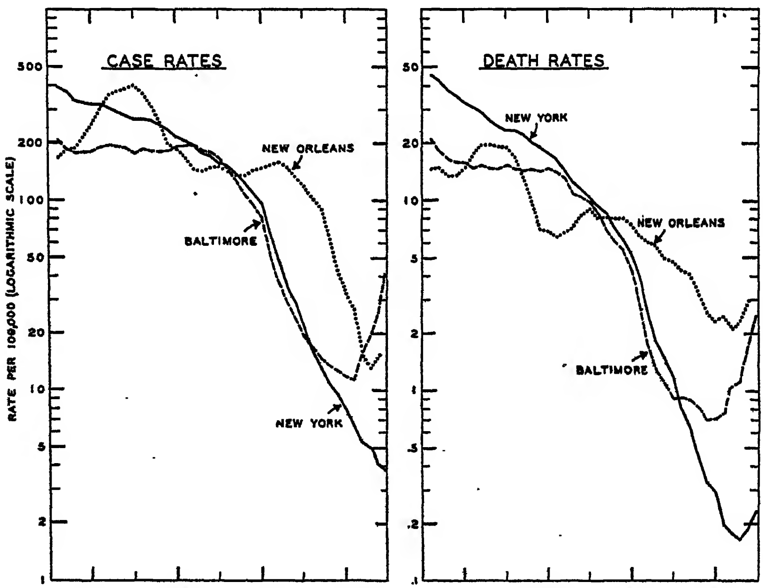

FIGURE 4.—Trend of diphtheria case and death rates in three large cities, 1906–45. (7-year moving averages of actual rates per 100,000 population, with a 5-year average for 1943, 3-year average for 1944, and the actual provisional rates for 1945 for New York and Baltimore. Data based on recorded deaths because resident deaths were available only for the last few years. Deaths recorded by city registrars and cases reported to city health departments (*4, 5, 6, 20*). New York City (6.4 percent colored in 1940) data are for total of white and colored. New Orleans (30.2 percent colored) data are for white only; Baltimore (19.4 percent colored) data are for white only but back of 1913 the death rate for white is estimated from that for the total population by ratios of white to total rate for the 6 years 1913 to 1918 which averaged 1.13. This ratio was applied to the 7-year moving averages back of 1913 to estimate the rate for white only. The case rate for white only was not available back of 1923 and was estimated in a similar way by an average of the ratios for the 6 years 1923–29, of 1.09. The ratios for both 6-year periods were based on the moving averages plotted in this figure)

[6] The two cities over 100,000 in the Mountain region did not afford sufficient data (4 deaths under 15) for reliable rates, so the Mountain and Pacific sections were combined as the West.

accessible data are New York City, Baltimore, and New Orleans.[7] In the two latter cities diphtheria rates vary greatly from year to year so they give a rather confused picture of the trend of the disease. The data plotted in figure 4 for all three cities are seven-period moving averages of the actual rates in each city. This seven-period moving average, even more than a three-period average, obscures any sharp changes in trends but does smooth out the data in a way that trends can be roughly compared. In New Orleans, as in the whole southern region shown in figure 3, the acceleration in the downward trend of diphtheria incidence began several years later than in Baltimore and New York City. The downward trend of the New Orleans curve parallels the trends in the other two cities, but the actual rates remain considerably above those in New York. Because of some slackening in the downward trend of the Baltimore incidence curve after about 1935 and actual increases in 1943, 1944, and 1945, rates in Baltimore and New Orleans were roughly the same for 1942 to 1944. Data not on the chart indicate that the incidence in New Orleans increased slightly in 1945. In New York City the decline in incidence continued through 1945.

The general trends of diphtheria death rates in the three cities are about the same as those for case incidence except that mortality in New Orleans remained above that in Baltimore and New York City from about 1929 through 1944. It may be seen that New York and Baltimore show some rise in diphtheria mortality in 1944 and 1945. Although the increase is small in terms of actual rates, it shows up as a considerable relative increase on a semilogarithmic chart like that used in figure 4. The New Orleans mortality rate was lower in 1945 than in 1944.

IMMUNIZATIONS AND TRENDS IN INCIDENCE

In view of the variation in the decline of diphtheria incidence and mortality in different parts of the country, with special reference to the lag in the South, it is of interest to consider the proportions of children of given ages in different geographic sections who have been immunized against the disease. No such data are obtainable for the general population of these regions but in a study of some years ago information of this kind is available from sample surveys in 28 cities of 100,000 or more inhabitants located in the several sections of the country (*7, 9*). The data were collected by house-to-house canvasses of families living in various census-enumeration districts of each city. In each household the informant, usually the housewife, was questioned in laymen's terminology as to whether any of the children under 25 years of age had ever been artifically immunized against

[7] A few smaller cities such as Charleston, S. C., have equally long series of such data but the population is not large enough to give much regularity to the trend of diphtheria rates.

diphtheria, and if so when the immunization was done. In the analysis the data were considered in two parts: (*a*) Immunizations done more than 12 months prior to the date of the interview, and (*b*) immunizations done during the year immediately preceding the date of the canvass, which was designated as the study year. Similar inquiries were made about cases of diphtheria and about certain other diseases and immunizations.

Data on the percentage of children of different ages who had been immunized prior to the study year have been published in considerable detail (*7*). The left section of figure 5 summarizes these percent-

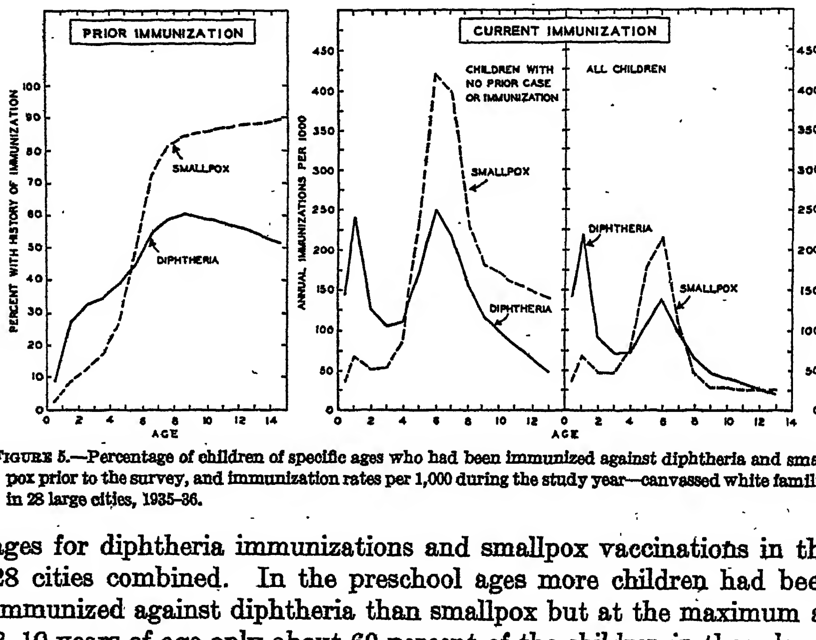

FIGURE 5.—Percentage of children of specific ages who had been immunized against diphtheria and smallpox prior to the survey, and immunization rates per 1,000 during the study year—canvassed white families in 28 large cities, 1935–36.

ages for diphtheria immunizations and smallpox vaccinations in the 28 cities combined. In the preschool ages more children had been immunized against diphtheria than smallpox but at the maximum at 8–10 years of age only about 60 percent of the children in these large cities had been immunized against diphtheria. However, many children acquire immunity to diphtheria by natural processes without a clinically recognized case. When the immunity acquired without artificial aid is taken into account, it may be computed that the 60 percent with a history of artificial immunization at the ages of 8–10 years represents some 75 to 80 percent of the children with actual immunity to diphtheria.[8] The declining percentage with a history of artificial immunization after the 8–10-year peak is presumably due to the fact that the older children passed through the ages when immunization was most actively carried out before the immunization program was as complete as at present.[9]

[8] For details of method of computation see table 2 of reference 10.

[9] Scarlet fever immunizations prior to the study were few. For the 28 cities combined, the maximum for any age was less than 3 percent, and the maximum for any age for any of the five geographic sections was 5 percent 7.

The age curve of immunizations during the study year may be considered in the same way as the age curve of the incidence of a communicable or other disease. Such data on immunizations are shown in table 2. In the right section of figure 5 are plotted for specific ages immunizations during the study year per 1,000 total children of that age, and in the middle section are plotted immunizations during the study year per 1,000 children not previously immunized or attacked. For comparative purposes similar rates of vaccination against smallpox are plotted in the same chart.

The first point on these charts (fig. 5) represents immunizations among children born during the study year, so a considerable part of their time under observation represents ages under 6 months; therefore, the average rate for the whole age group is low. The second point represents children who, at the middle of the study year, averaged 1.0 year of age; the diphtheria immunization rate based on the total children (right section) is higher at 1 year than at any other age, being considerably above the peak at the age of school entrance. However, the rate as based on children not previously immunized is slightly higher at 6 years than at 1 year of age. Apparently the times when diphtheria immunization is most likely to be done are during infancy and at school entrance; between those ages the rates for preschool children are much smaller, and after the age of school entrance immunization rates decrease rather rapidly.[10]

Vaccinations against smallpox during the study year per 1,000 total children (right section) are higher than immunizations against diphtheria from 4 to 7 and above 12 years of age. When the rates are based on children not previously vaccinated against smallpox (middle section), they are higher than similar diphtheria immunization rates at each of the ages above 4 years.

With figure 5 as a background for all cities combined, it is of more interest in connection with the present study to consider geographic variation in dipththeria immunization rates. Figure 6 shows for cities in five sections the percentage of white children who had been immunized prior to the study year, the percentage who reported a case of diphtheria prior to the study year, and immunization rates during the study year based on all children and on those not previously immunized or attacked. Since the trends of diphtheria shown in figures 3 and 4 indicate that the South and to a lesser extent the West have lagged behind other sections, immunizations in these regions are of particular interest. In the preschool ages the South ranks approximately with the North Central in the percentage of children who had been immunized prior to the study, the Northeast and West

[10] Scarlet fever immunizations during the study year amounted to about 3 per 1,000 children under 15 years of age, as compared with 72 for diphtheria immunizations. However, the relative age curves for the two types of current immunizations were similar, with high points at 1 and 6 years of age.

being below and the Intermediate section above those regions. However, for the ages 5 to 7 years the South is below all regions except the West, and above 7 years it is below all of the sections. The West, on the other hand, has the lowest percentages immunized from birth to 8 years but above that age it is in the middle with two sections below and two above. The Intermediate cities are at the top in the preschool ages but are low—next to the South—in the ages above 8 years. Considering all ages under 15 years, the South and West each had 39 percent of the children immunized, as compared with 48, 50, and 52 percent immunized in the Intermediate, Northeast, and North Central regions, respectively.

In terms of diphtheria immunizations during the study year per 1,000 children with no prior immunization or case (table 2 and fig. 6) the South is relatively high from 2 to 4 years and at 7 and older ages, but in infancy and the ages of school entrance other sections have higher rates. Considering all ages under 15 years the rate for the South is above both the West and the Northeast. The West is lowest in the preschool ages but is at the top in most of the ages above 6 years. However, it is the cumulative total of immunized children that is effective in preventing epidemics and in this respect the South is low.

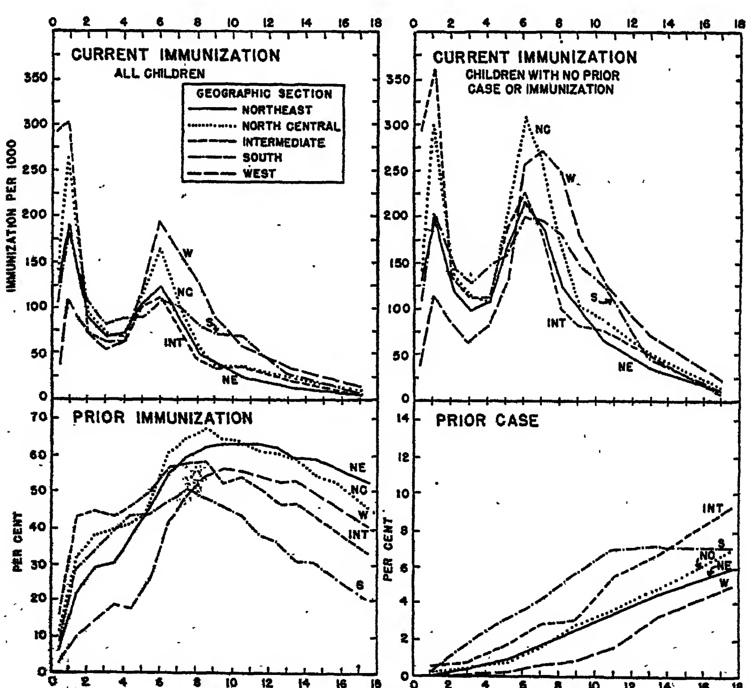

FIGURE 6.—Prior diphtheria immunizations and cases, and current immunizations among children of specific ages in five geographic sections—canvassed white families in 28 large cities, 1935–36.

Figure 6 shows also the proportion of children who, at the beginning of the study year, reported a history of a case of diphtheria at any time since birth. In this respect the South is highest and the Intermediate is next to the highest for most of the ages. The West, in spite of its low immunization rate, has a very low proportion of children with a history of an attack of diphtheria. These history data refer to white children.

TABLE 2.—*Diphtheria immunizations during the study year per 1,000 children of specific ages, in 5 geographic sections*[1]*—canvassed white families in 28 large cities, 1935–36*

Age last birthday at end of study year	All children: All sections	All children: Northeast	All children: North Central	All children: Intermediate	All children: South	All children: West	Children with no prior immunization or case[2]: All sections	Children with no prior immunization or case[2]: Northeast	Children with no prior immunization or case[2]: North Central	Children with no prior immunization or case[2]: Intermediate	Children with no prior immunization or case[2]: South	Children with no prior immunization or case[2]: West	All sections: All children	All sections: Children with no prior vaccination or case
	Annual diphtheria immunizations per 1,000 children												Smallpox vaccinations per 1,000	
Under 15	72.0	63.4	78.0	70.7	78.0	83.3	134.3	120.5	155.5	138.5	131.0	128.6	64.4	158.2
Under 1	144.1	128.9	141.7	295.3	108.6	38.9	144.1	128.9	141.7	295.3	108.6	38.9	35.4	35.4
1	219.6	191.5	267.6	304.6	186.5	110.1	240.6	203.5	301.7	361.8	204.6	113.6	66.8	68.3
2	91.4	93.3	94.9	77.6	105.7	76.2	125.9	120.0	140.2	135.9	148.1	84.7	46.6	50.1
3	71.1	71.4	74.3	63.3	84.4	56.1	104.9	99.9	117.3	114.0	129.5	64.0	46.1	52.6
4	72.5	74.4	68.7	65.1	90.1	65.2	109.9	106.9	111.0	114.0	147.9	80.8	71.9	86.0
5	107.7	107.0	117.1	102.6	91.1	108.9	174.1	168.8	197.0	189.2	161.4	133.2	176.6	240.9
6	140.1	125.1	167.6	113.1	109.2	195.2	249.9	221.0	312.0	227.7	202.0	260.3	218.0	422.4
7	99.1	89.1	101.8	76.7	101.7	164.8	217.3	189.9	258.3	181.7	199.3	275.2	111.0	398.7
8	65.5	55.0	61.4	44.8	84.6	132.9	156.6	128.8	169.8	103.2	183.9	251.5	45.8	234.0
9	47.5	40.1	39.4	34.7	73.4	92.9	116.2	103.4	104.5	83.1	150.2	185.4	30.2	181.5
10–11	38.2	26.1	37.0	37.1	68.6	58.7	88.9	66.8	88.1	78.2	126.3	130.5	26.8	162.7
12–14	22.2	15.3	24.6	22.0	28.7	35.9	47.2	36.6	53.2	44.3	47.0	72.6	26.9	140.1
Under 5	111.6	104.7	123.6	134.1	110.7	72.0	146.4	131.7	169.3	203.6	150.3	80.2	55.0	60.3
5–9	90.9	82.1	96.7	72.8	91.6	137.4	186.4	167.1	217.1	159.8	179.1	216.6	113.8	308.3
10–14	28.4	19.5	29.4	27.8	44.1	44.5	62.7	48.1	66.7	56.8	74.6	94.0	26.8	149.8
15–19	7.3	5.0	9.1	4.6	7.3	14.9	11.9	9.6	14.5	6.7	9.8	23.2	15.6	98.8
	Number of diphtheria immunizations												Number of smallpox vaccinations	
Under 15	11,424	3,768	3,549	1,555	1,359	1,193	10,881	3,605	3,325	1,498	1,306	1,147	10,225	9,436
Under 1	663	213	196	184	52	18	663	213	196	184	52	18	163	163
1	1,691	530	634	293	141	93	1,686	530	630	292	141	93	514	512
2	894	348	258	104	115	69	891	348	257	103	114	69	456	448
3	692	265	204	84	89	50	682	263	200	83	87	49	449	446
4	721	279	191	89	101	61	706	277	184	87	97	61	715	703
5	1,142	420	362	149	109	102	1,111	410	352	144	103	102	1,872	1,842
6	1,484	499	581	161	126	167	1,423	477	503	156	123	164	2,309	2,276
7	1,084	350	328	122	125	159	1,031	330	311	117	120	153	1,214	1,177
8	755	237	204	72	106	136	703	214	192	64	103	130	528	489
9	544	171	129	56	95	93	489	157	105	52	91	84	346	302
10–11	912	236	251	123	180	122	787	204	196	110	162	115	639	505
12–14	842	220	261	118	120	123	709	182	199	106	113	109	1,020	573
15–19	446	117	160	38	45	86	342	89	113	30	42	68	957	533

[1] All cities were 100,000 or over in population; those included in each section are: *Northeast:* Boston, Fall River, Buffalo, Syracuse, Newark, Trenton, Philadelphia, Pittsburgh. *North Central:* Chicago, Cleveland, Columbus, Detroit, Flint, Grand Rapids, St. Paul. *Intermediate:* Baltimore, Richmond, St. Louis. *South:* Atlanta, Birmingham, Dallas, Houston, New Orleans. *West:* Oakland, Portland, Salt Lake City, Seattle, Spokane.

[2] Few diphtheria reimmunizations were reported; among children in all sections under 15 years of age with a prior immunization, artificial immunizations during the study year amounted to 5.4 per 1,000. The rates by age were: under 5, 1.9; 5–9, 6.9; 10–14, 5.2; 15–19, 2.9.

Because of the considerable variation from year to year in diphtheria case rates, a 12-month record does not represent the typical incidence of the disease even aside from long-time trend. However, the data on the percentage of children with a prior attack of diphtheria should be supplemented with rates for the study year (table 3). In both large and small cities, diphtheria cases per 1,000 white children under 15 years of age in the South (including Intermediate) were approximately three times the corresponding rates in the North. The rates in the South are consistently high in each of the three age groups under 15 years. Data on a smaller group covered by the Communicable Disease Study make it possible to compute rates per 1,000 children not previously immunized or attacked; these data show the

TABLE 3.—*Incidence (new cases) of diphtheria and scarlet fever during the study year among white and colored persons and among residents of large and small surveyed cities, by geographic section, 1935–36*

[Communicable Disease Study and Health Survey combined]

Color, geographic section, and size of city [1]	Annual cases per 1,000 children				Number of cases [2]			
	All ages [2] under 15	Under 5	5–9	10–14	All ages [2] under 15	Under 5	5–9	10–14
	Diphtheria							
White:								
All sections:[3]								
100,000 or over	0.96	1.12	1.25	0.59	510	158	230	122
Less than 100,000	1.67	2.05	1.95	1.16	236	80	94	62
Northern cities:								
100,000 or over	.64	.84	.77	.38	241	84	101	56
Less than 100,000	.99	.88	1.32	.76	62	15	29	18
Southern cities:								
100,000 or over	2.35	2.61	3.25	1.37	237	69	114	54
Less than 100,000	2.86	3.79	3.24	1.86	168	62	64	42
Colored in cities of 100,000 or over:								
All sections [3]	1.38	1.41	1.71	1.03	96	28	42	26
Northern cities	1.02	.48	1.36	1.11	29	4	14	11
Southern cities	1.55	1.90	1.95	.91	55	19	24	12
	Scarlet fever							
White:								
All sections:[3]								
100,000 or over	11.1	8.2	16.9	7.9	5,913	1,158	3,130	1,625
Less than 100,000	9.6	6.9	14.1	7.5	1,357	270	683	404
Northern cities:								
100,000 or over	11.2	8.6	17.3	7.4	4,232	857	2,284	1,091
Less than 100,000	8.5	5.8	13.2	6.1	532	98	291	143
Southern cities:								
100,000 or over	5.8	4.6	9.6	3.1	582	122	338	122
Less than 100,000	6.1	4.7	8.7	4.8	358	77	172	109
Western cities:								
100,000 or over	20.5	11.9	28.4	19.8	1,099	179	508	412
Less than 100,000	23.5	16.9	33.1	20.1	467	95	220	152
Colored in cities of 100,000 or over:								
All sections [3]	4.2	3.7	5.9	2.9	291	73	145	73
Northern cities	7.1	6.5	9.7	4.7	201	54	100	47
Southern cities	1.7	1.2	2.4	1.4	60	12	30	18

[1] *Northern:* 15 cities listed in table 2 as in the Northeast and North Central, plus New York and Minneapolis. *Southern:* 8 cities listed as in the Intermediate and South, plus Cincinnati. *Western:* 5 cities listed as in the West, plus Los Angeles.

For machine tabulating reasons, cases and population with unknown income are excluded from the data for cities and towns of less than 100,000.

[2] Age last birthday as of end of study year.

[3] All sections includes the West. There were only 38 cases of diphtheria among white children under 15 years of age in the West, with a rate for cities over 100,000 of 0.60 (32 cases) per 1,000 canvassed population under 15 years.

same general picture of a higher incidence in southern than northern cities (table 4).

In contrast to the diphtheria situation, scarlet fever case rates during the study year were higher in the North and particularly in the West than in the South. The rates for white children in the South (including Intermediate) were consistently less than in the North and West in each of the three age groups under 15 years.[11]

Figure 6 discussed above shows the proportion of children of different ages who had been immunized prior to the study year. In considering immunizations in relation to the trend of diphtheria incidence and mortality over a period of years like that shown in figure 3, it is of interest to supplement data on the frequency of immunization histories with some measure of the years since children of given ages had been immunized. The schedule used in the Communicable Disease Study provided for the recording of the age of the child at the time of immunization as well as the age at the time of the canvass; from these records it was possible to compute the average years since immunization and also the percentage of children who had been immunized a specified number of years prior to the study. Figure 7 and table 5 show data of this kind. It is seen that for children of specific ages the average time since immunization was rather consistently less in the West and South than in the Northeast and North Central, and considerably less than in the Intermediate section.

TABLE 4.—*Incidence (new cases) of diphtheria during the study year per 1,000 children of known immunization status—canvassed white families in 15 northern and 8 southern cities with populations of 100,000 or over, 1935–36*

Geographic section [1]	All children					Children with no prior immunization or case				
	All under 15 [2]	Under 5	5–9	10–14	15–19	All under 15 [2]	Under 5	5–9	10–14	15–19
	Annual diphtheria cases per 1,000 children									
Northern cities	0.60	0.98	0.60	0.34	0.22	1.13	1.28	1.17	0.86	0.53
Southern cities	2.36	3.46	2.90	1.16	.42	3.51	4.18	4.88	1.74	.46
	Number of diphtheria cases									
Northern cities	63	27	22	14	9	58	27	19	12	9
Southern cities	93	35	40	18	6	73	29	31	13	4

[1] *Northern:* Northeast and North Central. *Southern:* Intermediate and South—see note to table 2.
[2] Age last birthday at end of study year.

[11] The 49 diphtheria deaths among white persons under 15 years of age in the canvassed population indicate case fatalities of 7.2 and 6.1 percent in the North and South, respectively. However, the small differences between the two sections are not consistent in the three 5-year age groups; the fatality under 5 years was higher in the South but that in the other two age groups was higher in the North. The 50 scarlet fever deaths among white children under 15 years indicated case fatalities of 0.86 and 0.42 percent in the North and South, respectively.

Thus in the South, where the percentage of children immunized was relatively low, the indications are that the average period of years since immunization was also short; apparently the programs for immunizing children started more recently in the South and West than in the North and Intermediate regions. The same general facts are indicated by the proportion of immunized children in each geographic section who had been immunized for seven or more years, where the proportions for the South and West are lowest (fig. 7).

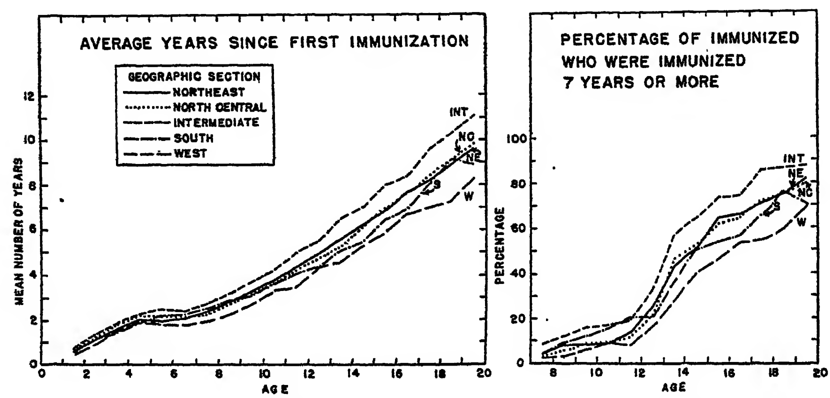

FIGURE 7.—Average years since diphtheria immunization and the proportion of immunized children of specific ages who had been immunized for seven or more years—canvassed white families in 28 large cities in five geographic sections, 1935–36.

TABLE 5.—*Average years since immunization for immunized persons of specific ages,*[1] *and percent of those immunized who had been immunized for 7 or more years—children of canvassed white household heads in 28 large cities classified by geographic sections, 1935–36*

Age last birthday at beginning of study year [1]	North-east	North Central	Inter-mediate	South	West	North-east	North Central	Inter-mediate	South	West
	Mean years from immunization to time of study [1]					Percent of immunized children who had been immunized for 7 or more years before the study [1]				
1	0.60	0.62	0.69	0.56	0.45	------	------	------	------	------
2	1.12	1.28	1.35	1.10	.93	------	------	------	------	------
3	1.64	1.84	1.87	1.43	1.50	------	------	------	------	------
4	1.99	2.22	2.27	1.92	1.96	------	------	------	------	------
5	1.94	2.20	2.48	2.21	1.88	------	------	------	------	------
6	2.06	2.16	2.41	2.26	1.80	------	------	------	------	------
7	2.34	2.29	2.73	2.54	1.94	4.4	3.2	8.2	4.0	2.2
8	2.82	2.75	3.20	2.89	2.24	7.9	5.8	12.2	8.4	3.1
9	3.27	3.19	3.74	3.18	2.71	8.1	8.5	15.9	11.8	5.4
10	3.79	3.63	4.29	3.60	3.35	8.5	9.1	16.9	15.2	8.3
11	4.36	4.24	5.02	4.08	3.49	13.8	11.8	19.3	20.0	8.0
12	4.96	4.76	5.53	4.40	4.37	24.8	21.2	32.8	20.1	15.8
13	5.66	5.33	6.53	5.08	4.65	43.2	46.0	57.0	36.5	27.8
14	6.27	6.11	7.05	5.99	5.31	50.7	52.3	64.0	50.3	39.6
15	6.87	6.99	8.05	6.43	5.95	63.9	61.2	73.0	53.2	45.2
16	7.68	7.66	8.40	6.96	6.74	65.9	64.3	73.9	56.5	53.1
17	8.22	8.46	9.60	8.05	7.03	71.0	71.8	85.2	65.0	54.2
18	8.97	9.11	10.33	9.15	7.33	74.5	75.1	86.4	75.3	59.1
19	9.65	9.88	11.09	8.93	8.33	81.1	79.4	87.4	70.3	69.1

[1] Immunization histories are recorded as of the beginning of the study year; ages are last birthday as of the same time, and years since immunization are years between immunization and the beginning of the study year. See table 2 for cities included in each section.

Correlation of diphtheria rates with percentages of children immunized.—Data are available for each of the 28 cities separately on the percentage of children of native white household heads who had been artificially immunized against diphtheria prior to the study year. Similar data for children of foreign-born household heads were not tabulated for individual cities but in all sections except the South, where the numbers of foreign-born are small, the percentages of children immunized were approximately the same for the foreign and the native white.[12] It appears logical, therefore, to use the data for the children of native white household heads as fairly representative in the matter of the extent of immunization in the respective cities. The number of diphtheria cases in the canvassed population during the study year was too small to yield reliable rates for individual cities, but cases reported to the city health departments are available. Using the percentage of children immunized in the native white canvassed population and the age-adjusted diphtheria case rate based on cases reported to the city health department (table 6), correlations were computed for the 28 cities, for 23 cities excluding the 5 southern cities, and for 23 cities excluding the 5 western cities. The correlation coefficients are shown in table 7. Some additional data were brought into the correlations: (*a*) The removal of the tonsils has been shown to be related to the incidence of diphtheria (*11*, *13*, *35*) so that fact, which was recorded on the schedule, was brought into the correlations; (*b*) Godfrey (*18*) indicated that with one-half or more of the children of the school ages immunized, the immunization of about one-third of the preschool children was sufficient to stop epidemics. This and other considerations led to the correlation of the diphtheria case rate with the percentage of children 5–14 years of age who had been immunized, holding constant by partial correlation the percentage of children under 5 years who had been immunized. The basic data that entered into the correlations are shown for each of the 28 cities in table 6.

Correlating the percentage of children under 15 years of age who had been immunized with the age-adjusted annual case rate for the 2 years 1935–36, the coefficient was −0.46. When the percentage of children under 15 whose tonsils had been removed was held constant, the correlation was increased only to −0.49. When the five southern cities were excluded the correlations were approximately the same, but the exclusion of the five western cities increased the coefficient to −0.59.

The correlation for the age-adjusted case rates with the percentage of children 5–14 years of age who had been immunized was −0.60 or somewhat higher than the −0.46 obtained by combining all ages under

[12] In the South the percentage of colored children immunized was less than for white children, but because of the small numbers of colored in the canvassed population this paper is based largely on white persons.

15 years. When the percentage of children under 5 years who had been immunized was held constant, the correlation was increased to −0.70. The exclusion of the five southern cities decreased these

TABLE 6.—*Percentage of children who were immunized prior to the study year and diphtheria case rates in each of the 28 surveyed cities, 1935–36*

	Children of specific ages [1] of native white canvassed household heads [2]								Diphtheria among all canvassed white children under 15 years [3]		Annual reported diphtheria cases per 1,000 persons of all ages in the total population		
	Percent immunized at beginning of study year					Percent with tonsils removed	Number of children				2 years 1935–36		6 years 1933–38
	Under 15	Under 5	5–9	10–14	5–14	Under 15	Under 5	5–14	Annual rate per 1,000	Number of cases	Age adjusted [4]	Crude	Crude
Northeast:													
Boston	43.0	14.3	54.2	57.9	56.1	30.3	3,669	8,085	36.8	13	15.2	15.2	16.1
Fall River	29.5	13.6	37.8	33.8	35.6	24.8	1,199	3,131	123.6	18	17.5	19.7	25.8
Buffalo	62.8	38.1	70.5	75.1	72.9	18.6	3,313	8,097	21.6	7	4.6	4.7	10.4
Syracuse	60.5	40.1	66.2	71.4	68.9	22.9	1,297	3,145	6.9	1	1.4	1.4	3.5
Newark	67.6	35.0	74.1	85.6	80.3	27.0	1,557	4,027	34.3	6	1.5	1.6	2.8
Trenton	49.2	13.9	55.3	67.2	61.9	21.3	1,097	3,051	37.9	4	4.7	4.8	7.1
Philadelphia	63.8	36.6	71.1	79.0	75.2	30.3	2,633	6,268	62.4	20	8.3	8.3	7.5
Pittsburgh	29.4	16.3	32.5	36.3	34.4	22.2	2,412	6,187	132.2	35	27.6	29.0	33.6
North Central:													
Cleveland	47.4	22.7	57.9	57.5	57.7	23.4	3,292	7,957	47.9	17	19.2	19.4	19.8
Columbus	16.7	9.3	20.1	19.7	19.9	21.7	1,174	2,701	133.0	15	48.0	45.7	42.5
Detroit	56.4	38.0	63.2	64.2	63.7	21.8	2,391	6,031	29.6	8	15.3	16.5	20.6
Flint	47.9	12.1	54.4	75.4	64.7	20.0	826	1,761	112.9	9	27.2	32.4	30.4
Grand Rapids	61.8	28.6	72.6	83.9	78.2	19.3	765	1,553	0	0	.3	.3	3.1
Chicago	69.8	61.8	77.5	68.7	73.1	26.2	3,533	8,767	156.7	62	21.4	20.8	15.9
St. Paul	54.1	13.5	65.7	75.1	70.6	29.3	1,166	2,867	0	0	9.6	9.6	11.1
Intermediate:													
Baltimore	56.7	47.6	62.7	58.1	60.3	27.0	2,992	7,486	29.3	9	15.5	15.8	17.8
Richmond	57.4	45.6	64.9	58.8	61.6	30.9	835	2,326	85.3	8	18.3	18.5	27.2
St. Louis	38.6	28.9	46.0	39.5	42.8	18.2	2,291	5,317	309.7	68	69.3	63.6	70.2
South:													
Atlanta	43.9	36.0	52.3	42.6	47.4	24.2	962	2,236	235.9	21	64.7	66.7	5.4
Birmingham	58.7	58.3	66.9	49.6	59.0	27.0	712	1,930	340.7	32	30.1	33.1	42.3
New Orleans	27.7	21.8	33.4	27.0	30.1	27.3	1,197	3,010	340.4	39	101.2	105.4	91.7
Dallas	52.5	40.2	66.9	49.6	57.6	29.7	1,063	2,512	209.0	22	91.2	91.2	102.0
Houston	27.7	20.8	31.9	29.9	30.9	17.2	897	1,913	224.2	21	99.9	100.9	81.5
West:													
Salt Lake City	44.0	10.5	54.4	65.6	60.0	41.3	1,201	2,498	8.7	1	5.2	6.2	7.2
Oakland	38.9	24.3	46.3	42.1	44.0	34.5	555	1,565	204.4	13	55.7	48.4	30.8
Portland	34.1	13.3	42.0	43.3	42.7	33.7	826	2,007	11.4	1	2.6	2.1	7.1
Seattle	41.2	13.1	44.5	60.7	53.7	33.6	826	1,865	0	0	2.6	2.2	4.2
Spokane	37.5	9.2	41.8	57.1	50.1	40.4	880	1,967	0	0	1.4	1.3	1.5

[1] Age last birthday at the beginning of the study year; immunization histories are recorded as of the same time.

[2] See table 1 in preceding paper (*9*) for further data about the canvassed and total population of each city.

[3] Diphtheria case rates in this column are based on the white population canvassed in the Communicable Disease Study and the Health Survey combined; in places where the percentage colored was small, the Health Survey data are for white and colored combined.

[4] Adjusted by the *indirect* method to the age distribution in 1935 of the total population of all 28 cities combined. Estimated populations for specific ages for each city in 1935 were obtained by averaging the 1930 and 1940 census populations for each age. Diphtheria case rates at specific ages per 1,000 canvassed population in the two surveys were used as standard rates and for a standard rate for all ages these rates were adjusted by the *direct* method to the age distribution of this estimated population for all 28 cities combined. Then the reported case rate for each city was adjusted by the *indirect* method as follows: The standard age-specific rates described above were multiplied by the population of the same age group for a given city to obtain an expected number of cases at all ages for that city if the age-specific rates were the same as the standard age-specific rates. This expected number of cases for all ages combined was divided by the estimated population of the city to obtain an expected rate. This expected rate for all ages was related to the standard rate (all cities combined) described above to obtain an adjustment factor which is of the nature of a percentage correction for differences in age distribution in the given city from the distribution in all cities combined. This adjustment or correction factor computed for each city is applied to the crude rate in that city to obtain its age-adjusted rate. A more detailed explanation of the process is given under the heading "Age adjusted death rates (A)" in Pearl (*24*), pp. 270–274.

correlations slightly and the exclusion of the five western cities increased them but not significantly.

To summarize, the percentage with tonsils removed prior to the study is not highly correlated with diphtheria rates during the study year in these cities. Also, the percentage of children under 5 years who had been immunized shows no correlation with age-adjusted diphtheria rates for all ages. In the whole 28 cities the percentage of children 5–14 years of age who had been immunized gives the best

TABLE 7.—*Correlation between age-adjusted reported diphtheria case rates for the 2 years 1935–36 and the percentage of children who had been immunized prior to the approximate beginning of that period—28 surveyed cities in 19 States* [1]

Items correlated or held constant	All 28 cities	23 cities (excluding 5 southern)	23 cities (excluding 5 western)
	Correlation coefficients [2]		
Age-corrected reported diphtheria case rate:			
With percent of children under 15 years who had been immunized [3]	−0.465	−0.455	−0.590
Percent of children under 15 years with tonsils removed, held constant [4]	−.488	−.515	−.588
With percent of children 5-14 years who had been immunized	−.600	−.573	−.678
Percent of children under 5 years who had been immunized, held constant [4]	−.702	−.664	−.718
With percent of children under 5 years who had been immunized	+.052	−.021	−.097
With percent of children under 15 years with tonsils removed	−.245	−.264	−.103

[1] See table 6 for detailed data for each city and the methods of tabulation and computation. Reported case rates refer to the whole city but immunization rates refer to children of native white canvassed household heads.

[2] Standard errors of the correlation coefficients are: Based on 28 items, ±0.189; based on 23 items, ±0.209.

[3] Correlation of the percentages of children under 15 years who had been immunized and the diphtheria case rate per 1,000 children under 15 years in the canvassed population in the 28 cities was −0.31. It will be noted in table 6 that the numbers of cases in this group were small.

[4] Zero order coefficients of correlations not shown in the table but entering into the computation of the partial correlations were:

(a) Percent of children under 5 years and 5-14 years who had been immunized: All 28 cities, +0.459; 23 cities excluding South, +0.532; 23 cities excluding West, +0.467.

(b) Percent of children under 15 years of age who had been immunized and percent under 15 years with tonsils removed: All 28 cities, −0.034; 23 cities excluding South, −0.142; 23 cities excluding West +0.282.

correlation with diphtheria rates when the percentage under 5 years who had been immunized is held constant, −0.70. Since the square of the correlation coefficient is a rough measure of the proportion of the total variability that is accounted for by the factors entering into the correlation, immunization apparently accounts for approximately half of the variability in the diphtheria rate in these cities.[13] The presence of correlation does not necessarily mean that immunization was the direct or causative factor—its relationship to the case rate may come through its effect upon other factors. The direct effect is a reduction in the number of Schick-positive children in the population but there may be indirect relationships to other factors such as the carrier rate (*23*) and the frequency of contact between susceptibles and diphtheria cases and carriers.

[13] The variation in the completeness of reporting of diphtheria in these cities is an uncontrolled factor but the numbers of cases recorded in the relatively small canvassed population were not sufficient in individual cities to use as a basis for rates for correlation purposes or for correcting the reported case rate for incompleteness.

The fact that there was no correlation between the case rate and the percentage of children under 5 who had been immunized suggests that more emphasis might be placed upon the Schick-test status of the child at school entrance. In a recent statement from the Baltimore City Health Department it is suggested that in addition to immunization at as early an age as possible, children entering school for the first time be given a booster dose of diphtheria toxoid unless the child has been inoculated within 3 years. This recommendation is made on the assumption that the low incidence of the disease in recent years has removed "the reinforcing stimulus necessary for maintaining immunity bestowed by toxoid given in infancy".[14] Substantially the same recommendations are made in a paper on immunizations and diphtheria in Kingston, N. Y.

VARIATION IN DIPHTHERIA INCIDENCE AND MORTALITY

Survey data thus far presented have come largely from the Communicable Disease Study of 28 cities of 100,000 or more population. The National Health Survey covered 27 of the same cities with larger surveyed samples, and 4 other large cities and many smaller cities and towns; however, the canvassed population was heavily weighted by large cities. Although the Communicable Disease Study included specific questions about diphtheria and the National Health Survey only recorded the disease along with other causes of disabling illness, the case rates for all children under 15 years in the two surveys were similar, 1.04 per 1,000 in the 28 cities of the Communicable Disease Study as compared with 0.93 for the 31 cities of 100,000 or more in the Health Survey [15] and 1.13 for all cities and towns included in the Health Survey.

Variation with age.—Table 8 shows the age incidence of diphtheria, scarlet fever, and whooping cough, and figure 8 shows the curves on a relative basis, in the form of the ratio of the rate at each age to the rate under 15 years. Diphtheria rises rapidly to a maximum at 3 to 4 years which is maintained through the sixth year. Scarlet fever, on the other hand, rises more slowly to a maximum at 7 years with an immediate and fairly steep decline thereafter. Whooping cough has the youngest age distribution, reaching at the end of the first year of life a level which is maintained through the sixth year, but with an abrupt decline thereafter. It must be remembered that these curves represent relative age incidence and give no indication of the actual rates for the different diseases.

[14] From a communication to all physicians in Baltimore, dated Aug. 6, 1945, from Huntington Williams, Commissioner of Health, Baltimore City.

[15] Twenty-seven of the thirty-one cities are included in the Communicable Disease Study but there was no overlapping in the census enumeration districts canvassed within a city. The four additional cities were New York, Los Angeles, Cincinnati, and Minneapolis with very large samples for the first two, so exact agreement would not be expected.

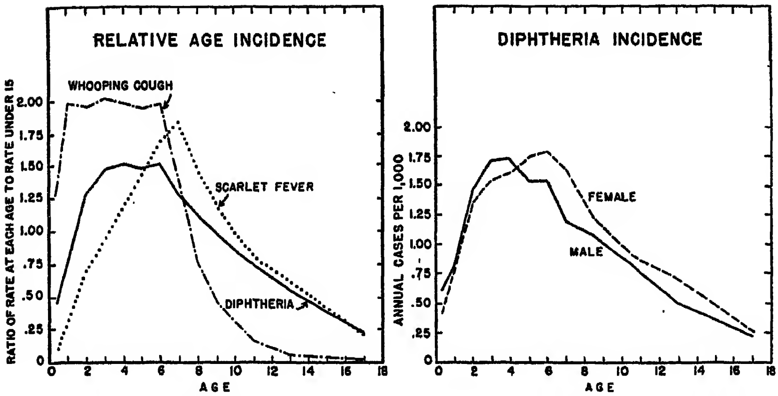

FIGURE 8.—Relative age incidence of certain communicable diseases, and diphtheria incidence among boys and girls of specific ages—canvassed white families in 84 cities and towns in 19 States, 1935–36.

TABLE 8.—*Age and sex incidence (new cases) of diphtheria, scarlet fever, and whooping cough during the study year*[1] *2,923,309 persons in canvassed white families in 84 cities and towns in 19 States, 1935–36*

[Communicable Disease Study and Health Survey combined]

Age last birthday at end of study year	Diphtheria			Scarlet fever			Whooping cough			Population	
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Male	Female
All ages[2]	0.33	0.30	0.36	2.94	2.96	2.91	3.8	3.8	3.8	1,411,122	1,512,187
All under 15	1.11	1.05	1.16	10.80	10.75	10.85	16.0	15.3	16.7	341,366	335,101
Under 1	.51	.60	.41	1.11	1.09	1.13	20.4	19.9	21.0	10,063	9,708
1	.81	.82	.79	3.48	3.83	3.11	31.7	30.1	33.4	16,973	16,375
2	1.42	1.48	1.35	7.55	7.47	7.46	31.2	29.3	33.3	21,565	20,805
3	1.64	1.72	1.55	10.06	10.77	9.32	32.0	31.0	33.0	21,453	20,697
4	1.67	1.73	1.61	12.81	12.17	13.47	31.7	29.5	33.9	21,939	21,164
5	1.64	1.54	1.75	15.50	15.89	15.10	31.0	28.2	33.8	22,724	22,315
6	1.67	1.54	1.79	18.22	17.49	18.97	31.5	30.9	32.2	22,702	22,294
7	1.42	1.19	1.65	19.63	19.70	19.54	22.1	22.1	22.2	23,446	23,024
8	1.12	1.13	1.11	15.69	15.39	16.00	12.4	12.2	12.5	24,694	24,249
9	1.17	1.02	1.33	12.97	12.18	13.77	7.1	6.5	7.8	24,544	24,102
10–11	.87	.83	.91	9.66	9.72	9.61	3.6	3.6	3.6	50,631	50,286
12–14	.60	.50	.70	6.65	6.75	6.54	1.0	1.0	1.0	80,632	80,082
Under 5	1.32	1.38	1.25	7.93	7.99	7.88	30.4	28.9	32.0	91,993	88,749
5–9	1.40	1.28	1.52	16.36	16.08	16.64	20.5	19.6	21.3	118,110	115,984
10–14	.70	.62	.78	7.81	7.89	7.72	2.0	2.0	2.0	131,263	130,368
15–19	.24	.22	.26	2.13	2.20	2.07	.3	.2	.3	125,950	136,212
20–24	.20	.09	.28	.74	.47	.97	.2	.1	.2	118,645	140,490
25–34	.10	.06	.15	.65	.45	.82	.2	.1	.2	233,439	265,471
35–44	.08	.06	.09	.33	.24	.41				224,906	238,485
45–54	.02	.01	.03	.09	.09	.10	.1	.03	.1	181,818	181,718
55 and over	.02			.04	.03	.04				183,685	211,294
	Number of cases										
All ages	966	429	537	8,581	4,183	4,398	11,100	5,312	5,788	----------	----------
All under 15	749	360	389	7,306	3,670	3,636	10,818	5,236	5,582	----------	----------

[1] The population used for under 1 year of age represents one-half of the persons born during the study, since the time they were under observation would average one-half year.

[2] All ages includes a few of unknown age. Diphtheria case rates per 1,000 for ages 8 and 9 combined are: Both sexes, 1.15; males, 1.08; females, 1.22.

The age curve of mortality in the continental United States is a useful supplement to the morbidity data.[16] Because of the inaccuracy of intercensal population estimates and a special supplementary volume on deaths in 1939 and 1940 (*30*), deaths for those years are used in relation to the 1940 census populations (table 9). The peak in the diphtheria death rate for the country as a whole comes at 2 years with a decline as age increases thereafter, which, relatively, is considerably more rapid than that in the case incidence. Although mortality is less in large cities, the peak in the rate occurs at approximately the same age.

Annual scarlet fever mortality among white persons for the same period was less than half that of diphtheria, 1.8 deaths per 100,000 persons under 15 years of age, as compared with 4.5 for diphtheria. The peak mortality of scarlet fever among white children occurs at 1 to 3 years but the relative variability of the rates with age is less than in diphtheria mortality.[17]

A comparison of diphtheria death rates of white children of specific ages in the general population in 1929–30 (*10*) with those for 1939–40 indicates that the greatest relative or percentage decline in mortality in the 10-year period occurred for the ages 10–14 years where the reduction was 82 percent, as compared with 75 percent for 15–19 years, 80 percent for 5–9 years, and 73 percent for children under 5 years. The reduction among infants under 1 year of age was 68 percent, with 72-, 73-, 75-, and 76-percent reductions for the ages 1, 2, 3, and 4 years, respectively.

Sex differences.—The right half of figure 8 shows diphtheria incidence for boys and girls. The curve for boys rises to a peak at 3 to 4 years with a rate for every age under 5 years that is larger than that for girls. The incidence for girls rises more slowly to a peak at 5 to 6 years with rates thereafter that are consistently larger than those for boys. Although not shown graphically, it may be seen in table 8 that the incidence of scarlet fever is almost identical for boys and girls. Considering all ages under 15, the rate for males is 10.7 and that for females is 10.8 per 1,000; in the specific ages the rate for girls is slightly above that for boys at one or two ages followed by one or two ages in which the reverse is true. For whooping cough the rates

[16] The decrease in diphtheria death rates has been so great that only the relative age curves for 1939–40 and 1935–36 can be compared. The few deaths in the survey of 1935–36 indicated a mortality rate of 7.2 per 100,000 children under 15 years of age, as compared with estimated rates of 10.2 and 7.8 for the continental United States in 1935 and 1936, respectively. The survey data are heavily weighted by the large cities and the mortality from diphtheria is less in large cities than in rural areas (*33*).

[17] The 49 diphtheria deaths among white persons under 15 years of age in the surveyed population indicate a case fatality of 6.5 percent. The fatality under 5 years of age was 11.3 percent (27 deaths); at 5–9, 4.6 percent (15 deaths); and at 10–14, 3.8 percent (7 deaths). There were only 5 diphtheria deaths above those ages. The 50 scarlet fever deaths among white persons under 15 years of age in the surveyed population indicate a case fatality of 0.68 percent or approximately one-tenth of the corresponding rate for diphtheria. Scarlet fever fatalities for other ages were: Under 5 years, 1.46 percent (21 deaths); 5–9 years, 0.60 percent (23 deaths); and 10–14 years, 0.29 percent (6 deaths). Only 6 deaths occurred above those ages.

TABLE 9.—*Annual diphtheria and scarlet fever mortality at specific ages in the general population of the United States [1] 1939–40*

Age	Annual deaths per 100,000 population							Number of deaths in the 2 years				
	Both sexes			All sizes and rural				Both sexes all races		All sizes and rural		
				White						White		
	All cities and rural	Cities of 100,000 or over	Cities under 100,000 and rural	Both sexes	Male	Female	Colored, both sexes	Cities of 100,000 or over	Cities under 100,000 and rural	Male	Female	Colored, both sexes
	Diphtheria											
All ages	1.31	0.61	1.60	1.24	1.32	1.15	1.98	463	2,991	1,574	1,347	533
All under 15	4.67	2.38	5.36	4.47	4.82	4.10	6.06	366	2,711	1,419	1,166	402
Under 1 [2]	6.70	4.05	8.77	6.34	7.25	5.39	9.21	38	272	151	106	53
1	12.71	3.39	15.48	11.98	13.82	10.06	18.29	32	491	256	179	88
2	12.92	5.97	14.99	12.16	13.29	10.99	18.21	60	508	260	207	101
3	10.37	4.54	12.05	10.03	10.64	9.40	12.71	43	396	199	171	69
4	8.55	4.41	9.73	8.21	8.07	8.36	10.87	42	326	154	153	61
Under 5	10.47	4.49	12.23	9.95	10.85	9.01	14.18	215	1,993	1,020	816	372
5–9	3.39	2.36	3.70	3.38	3.51	3.24	3.50	115	610	333	297	95
10–14	.61	.63	.64	.57	.63	.52	.90	36	108	66	53	25
15–19	.25	.29	.23	.23	.18	.28	.37	19	42	20	31	10
	Scarlet fever											
All ages	.58	.40	.65	.61	.60	.62	.28	301	1,220	713	733	75
All under 15	1.70	1.49	1.77	1.83	1.82	1.84	.78	228	894	535	524	63
Under 1	1.49	1.07	1.90	1.53	1.63	1.42	1.22	10	59	34	28	7
1	3.09	2.86	3.15	3.39	3.83	2.92	.83	27	100	71	52	4
2	3.09	2.49	3.28	3.41	3.32	3.50	.90	25	111	65	66	5
3	3.02	3.49	2.89	3.28	3.21	3.35	1.29	33	95	60	61	7
4	3.09	3.05	3.10	3.15	2.88	3.44	2.67	29	104	55	63	15
Under 5	2.81	2.59	2.88	3.01	3.03	2.98	1.45	124	469	285	270	38
5–9	1.73	1.72	1.73	1.87	1.83	1.91	.74	84	285	174	175	20
10–14	.68	.35	.83	.75	.72	.78	.18	20	140	76	79	5
15–19	.41	.18	.49	.45	.41	.49	.07	12	88	45	53	2

[1] Based on Vital Statistics of the United States, pt. III, 1939–40 (*30*).
[2] 1940 census population except that the rate for under 1 year is based on the number of live births in all categories except by size of city.

for girls under 10 years are slightly but consistently higher than for boys.

In diphtheria mortality among white persons, as in case incidence, the rates in the younger ages are somewhat higher for boys than girls (table 9). At 5–9 and 10–14 years mortality is also slightly higher for boys, in contrast to case rates, but at 15 to 54 years the small rates are consistently higher for females for both mortality and incidence. Above 55 years, mortality is again higher for males. Unlike diphtheria, scarlet fever mortality shows no definite or consistent differences between the rates for males and females.[18]

[18] The 49 diphtheria deaths among white persons under 15 years of age recorded in the survey indicate case fatalities of 7.8 and 5.4 percent among boys and girls respectively; however, the differences are not consistent in the three age groups. The 50 scarlet fever deaths under 15 years of age in the surveyed group indicate case fatalities of 0.90 and 0.47 percent for boys and girls respectively, with consistently lower fatality rates for girls in the three 5-year age groups. In connection with the apparent inconsistency in scarlet fever as among incidence, mortality, and case fatality, it must be remembered that death rates quoted above are for the total United States but case fatalities are based on the relatively few deaths in a surveyed group which is heavily weighted with residents of large cities.

Racial variation.—Negroes have traditionally been considered less susceptible than white persons to many of the communicable diseases, including diphtheria. Table 3 shows diphtheria incidence for colored and white in northern and southern cities of 100,000 or over that were covered in the survey. The 29 cases under 15 years of age among the colored in the North give rates that are somewhat higher than those for white in the ages above 5 years. However, in the South the incidence for the colored under 15 years is consistently lower than for the white. Scarlet fever incidence is consistently less among colored than white in both North and South.

Twenty-five years ago diphtheria death rates were generally less for colored [19] than white persons, and immunity as measured by the Schick test was as prevalent or more prevalent among colored than among white children (*1, 3, 12*). However, in the continental United States in 1939–40 the diphtheria death rate per 100,000 children under 15 years was 6.1 for colored as compared with 4.5 for white, with consistent excesses for the colored in the various ages up to 45 years (table 9).

Table 10 shows diphtheria mortality by years from 1930 to 1940 for white and colored of all ages in the South. Among the years 1930–34 there was only one with an excess for the white of less than 60 percent over the colored rate, but by 1940 the white rate was only 14 percent above the colored. Comparing the period 1931–33 with 1940, the white rate fell from 9.5 to 2.2 per 100,000 (76 percent) and the colored from 5.6 to 2.0 (64 percent). Thus in both actual rates and percentage

TABLE 10.—*Trend of diphtheria and scarlet fever mortality per 100,000 white and colored population of the 17 States in the 3 southern sections [1] of the United States, 1930–40*

	Year										
	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
	Diphtheria										
White	7.24	9.84	9.90	8.78	7.16	6.27	5.00	4.13	4.04	3.28	2.24
Colored	5.27	5.97	5.52	5.20	4.34	4.31	3.83	2.84	2.84	2.51	1.97
	Scarlet fever										
White	1.69	2.00	1.64	1.64	1.64	1.35	1.09	0.90	0.78	0.54	0.47
Colored	.43	.44	.35	.35	.35	.32	.14	.24	.20	.17	.17

[1] South Atlantic and East and West South Central States. Population estimates and deaths from the U. S. Bureau of the Census.

[19] An examination of rates (*31*) for the decade 1910–20 indicates that diphtheria mortality was less for colored, not only for whole States where poor registration of deaths among the rural Negroes might have contributed to the deficiency for colored, but it was generally true also in large cities of both the South and the North. In many cities average rates for white persons over a considerable period were more than 50 percent in excess of those for colored, but there were a few cities where the rates were approximately the same.

declines, the advantage of the colored in diphtheria mortality seems to be disappearing.

Since so many of the colored people live in the rural South where diphtheria mortality is high, a more precise comparison can be made by limiting the data to cities over 100,000 population in the South. In this group in 1939–40, annual diphtheria deaths under 15 years per 100,000 children of those ages amounted to 4.8 for colored and 4.2 for white (table 11). Aside from a slightly lower rate for colored under 1 year of age, the few deaths indicate a small excess in the death rate for colored over that for white in each of the age groups 1–2, 3–4, 5–9, and 10–14 years.

TABLE 11.—*Annual diphtheria and scarlet fever mortality among residents of the 92 cities with populations of 100,000 or over in the different geographic sections [1] of the United States, 1939–40*

Geographic section [1]	Annual deaths per 100,000 population					Number of deaths [2] in the 2 years				
	All ages	All under 15	Under 5	5–9	10–14	All ages	All under 15	Under 5	5–9	10–14
	Diphtheria									
Northeast	0.27	1.06	2.23	1.04	0.17	85	67	42	21	4
North Central	.74	2.91	4.14	3.83	1.04	179	145	66	60	19
West	.93	2.85	5.71	1.73	1.16	80	42	28	8	6
South [3]	.98	4.34	9.65	3.15	.75	119	112	79	26	7
White	.92	4.18	9.44	3.01	.58	84	79	57	18	4
Colored	1.18	4.79	10.23	3.52	1.22	35	33	22	8	3
	Scarlet fever									
Northeast	0.29	1.01	2.02	1.09	0.17	89	64	38	22	4
North Central	.66	2.59	4.51	3.07	.49	159	129	72	48	9
West	.28	.82	.61	1.08	.77	24	12	3	5	4
South	.24	.89	1.34	1.09	.32	29	23	11	9	3
White	.24	.85	1.49	.84	.29	22	16	9	5	2
Colored	.24	1.02	.93	1.76	.41	7	7	2	4	1

[1] *Northeast:* 30 New England and Middle Atlantic cities. *North Central:* 27 East and West North Central cities; *South:* 23 South Atlantic and East and West South Central cities. *West.* 12 Mountain and Pacific cities. Population as enumerated in the Federal census of 1940.
[2] Based on Vital Statistics of the United States, Part III, 1939–40 (30).
[3] Diphtheria rates per 100,000 in South; under 1 year, white 11.3 (14 deaths), colored 9.6 (4 deaths); 1–2 years, white 10.1 (25 deaths), colored 12.9 (11 deaths); 3–4 years, white 7.7 (18 deaths), colored 7.9 (7 deaths).

A prior publication (7) indicated that in the surveyed group in the South the proportion of children of specific ages who had been immunized against diphtheria was consistently less for colored than white. It is possible that more immunization among white children has brought their death rates to lower levels than those of the colored. Death registration for both races should be reasonably complete in large cities.

In the continental United States in 1939–40 the annual scarlet fever death rate per 100,000 colored children under 15 years was 0.78, as compared with 1.83 for white, with consistent excesses for the white at each age. However, scarlet fever mortality is low in the South where the colored are concentrated; the few deaths in southern cities

with more than 100,000 population indicate that in 1939–40 the annual scarlet fever mortality for colored was 1.02 per 100,000 children under 15 years, as compared with 0.85 for white children of those ages. While the numbers (7 and 16 deaths for white and colored, respectively) are too small to have statistical significance, they suggest that underregistration in the rural areas of the South and the concentration of the Negroes in the geographic section with the lowest scarlet fever mortality may be factors in the apparently low colored rate.

Variation with urbanization.—Table 3 shows diphtheria and scarlet fever incidence in surveyed large cities as compared with towns and small cities. Diphtheria case rates in both the North and the South are rather consistently higher in the towns and small cities than in metropolitan places. However, the scarlet fever situation varies in different sections, probably indicating that there is considerable variation from year to year also.

Table 12 shows for the 2 years 1940–41 diphtheria and scarlet fever mortality in cities of different sizes and in rural areas. Considering all sections combined, the diphtheria death rate is lowest in cities of 100,000 or over with a steady progression to a rate in villages and rural areas that is 3 times that in large cities. The Northeast, East North Central, and West show small and somewhat irregular differences between rates in urban and rural areas, but the West North Central and particularly the South show higher diphtheria mortality rates in small towns and rural areas. Scarlet fever death rates are small and irregular but they tend to be somewhat higher in rural areas.

TABLE 12.—*Annual diphtheria and scarlet fever mortality among residents of cities of different sizes and rural areas, by geographic section,*[1] *1940–41*

Size of city	Annual deaths per 100,000 population						Number of deaths in the 2 years					
	All sections	Northeast	East North Central	West North Central	South	West	All sections	Northeast	East North Central	West North Central	South	West
	Diphtheria											
100,000 or over	0.49	0.20	0.61	0.46	0.80	0.84	370	62	114	25	97	72
10,000–100,000	.73	.28	.54	.52	1.56	1.00	360	51	61	20	179	49
2,500–10,000	1.21	.24	.68	1.08	2.62	.83	283	15	33	29	183	23
Rural	1.52	.25	.64	.92	2.46	1.25	1,737	42	117	138	1,296	144
	Scarlet fever											
100,000 or over	0.31	0.23	0.55	0.28	0.23	0.19	235	72	104	15	28	16
10,000–100,000	.36	.26	.59	.49	.27	.35	179	46	66	19	31	17
2,500–10,000	.52	.39	.70	.64	.49	.47	122	24	34	17	34	13
Rural	.51	.52	.85	.55	.40	.41	586	87	157	83	212	47

[1] Geographic sections: *Northeast:* New England and Middle Atlantic. *South:* South Atlantic and East and West South Central. *West:* Mountain and Pacific.

Variation with family income.—Table 13 shows diphtheria case rates during the study year among surveyed families of different income levels. Diphtheria case rates for the group of children under 15 years of age decrease consistently from 1.63 per 1,000 in relief families to 0.43 in families with annual incomes of $3,000 or above. The decline in case rates as income increases is reasonably consistent in all four age groups shown in the table. A prior publication (7) indicated that the proportions of children immunized against diphtheria were considerably greater in the higher income groups, particularly of children under 5 years of age.

TABLE 13.—*Incidence (new cases) of diphtheria and scarlet fever during the study year among persons in canvassed white families of different annual income levels in cities with populations of 100,000 or over, 1935–36*

Age last birthday at end of study year	Annual cases per 1,000 population					Number of cases				
	Relief	Nonrelief				Relief	Nonrelief			
		Under $1,000	$1,000–$1,500	$1,500–$3,000	$3,000 and over		Under $1,000	$1,000–$1,500	$1,500–$3,000	$3,000 and over
	Diphtheria									
All under 15	1.63	1.53	0.83	0.79	0.43	246	193	139	146	14
Under 5	1.84	1.79	.96	1.02	.56	75	63	45	48	4
5–9	1.93	1.92	1.16	1.01	.36	101	82	68	65	4
10–14	1.22	1.00	.42	.45	.43	70	48	26	33	6
15–19	.43	.25	.28	.14	.12	21	12	17	11	2
	Scarlet fever									
All under 15	12.9	8.4	10.4	11.1	10.6	1,938	1,057	1,746	2,066	340
Under 5	11.4	6.1	7.7	7.2	4.7	462	214	363	337	34
5–9	18.3	13.1	15.7	17.6	16.4	955	559	920	1,132	182
10–14	9.0	5.9	7.5	8.1	8.9	521	284	463	597	124
15–19	2.7	1.6	2.2	2.0	2.4	130	79	132	157	39

Aside from rather consistently higher scarlet fever rates among children in relief families, no definite income differences appear in the incidence of the disease. Among nonrelief families, the rates per 1,000 children under 15 years are about as high in the upper- as in the lower-income groups. Considering age incidence, scarlet fever rates under 5 years are roughly the same as at 10–14 years except in relief families where they are higher for the younger ages, and in families with incomes over $3,000 where the rate at 10–14 years is considerably higher than under 5 years.

ATTACK RATES AMONG NONIMMUNIZED AND IMMUNIZED CHILDREN

Table 14 shows for the Communicable Disease Study diphtheria case rates among all children and among those with no prior case or artificial immunization. The latter group would include some indi-

viduals who have acquired immunity by natural means, but in the absence of Schick tests it is the nearest approach to persons susceptible to diphtheria. If the incidence rates for the detailed ages among these "susceptibles" are applied to the numbers of children of corresponding ages in the group with a prior immunization but no prior case and the expected cases summated for children under 15 years, it is found that 120 cases would be expected if none had been previously immunized, but only 20 cases actually occurred. Computation of the standard error indicates that the 100 difference between expected and actual is statistically significant ($P=<0.0001$).

TABLE 14.—*Age incidence (new cases) of diphtheria among all children and among those with no prior immunization or case—canvassed white families in two surveys, 1935–36*

Age last birthday at end of study year	Communicable Disease Study (28 large cities)						Health Survey (83 cities and towns)		
	All children			Children with no prior immunization or case			All children		
	Case rate per 1,000	Number of cases	Population	Case rate per 1,000	Number of cases	Population	Case rate per 1,000	Number of cases	Population
All under 15	1.04	165	158,677	1.68	136	80,992	1.13	584	517,790
Under 1	.43	2	4,600	.43	2	4,600	.53	8	15,171
1	1.04	8	7,699	1.14	8	7,008	.74	19	25,649
2	1.64	16	9,782	2.12	15	7,077	1.35	44	32,588
3–4	1.88	37	19,682	2.48	32	12,926	1.59	104	65,571
5–6	1.42	30	21,190	2.07	25	12,075	1.73	119	68,845
7–9	1.09	37	33,905	2.01	27	13,442	1.28	141	110,154
Under 5	1.51	63	41,763	1.80	57	31,611	1.26	175	138,979
5–9	1.22	67	55,095	2.04	52	25,517	1.45	260	178,999
10–14	.57	35	61,819	1.13	27	23,864	.75	149	199,812
15–19	.29	18	61,262	.52	15	28,777	.23	46	200,900

Diphtheria secondary attack rates among the few children not previously immunized or attacked but exposed during the study year to another case in the household are shown in table 15. Applying the age-specific secondary attack rates for diphtheria in table 15 to children with a prior immunization but no prior case who were exposed to a case in the household during the study year, there was an expectancy of 8 diphtheria cases [20] in the 68 children under 15, as compared with 4 actual cases. While no statistical significance can be attached to these small numbers, they suggest that some children who had been artificially immunized prior to the study and might have resisted less intensive exposure did not have sufficient antitoxic immunity to withstand the intensive exposure of household contact.

Applying the age-specific diphtheria incidence rates for children with no prior immunization or case to children who had suffered an

[20] This computation is based on secondary attack rates using only one primary case per household, but the use of all cases occurring on the first day as primary cases changes the expected number of diphtheria cases only from 7.8 to 7.0. Secondary attack rates are used in 5-year age groups only.

attack of diphtheria prior to the study year,[21] there was an expectancy of 5 cases in the 3,717 children under 15 years, as compared with 8 actual cases. While the numbers are small, it may be noted that this finding is in agreement with the theory that diphtheria cases treated with antitoxin at an early stage of the disease do not result

TABLE 15.—*Secondary attack rates for diphtheria and scarlet fever among all children and among those with no prior immunization or case—canvassed white families in 28 large cities, 1935–36*

Age last birthday at end of study year	All children				Children with no prior immunization or case			
	Number of persons exposed [1] to case in household	Number attacked	Secondary attack rate per 100	Case rate per 100 in surveyed population	Number of persons exposed [1] to case in household	Number attacked	Secondary attack rate per 100	Case rate per 100 in surveyed population
	Diphtheria							
All under 15	269	30	11.2	0.104	192	25	13.0	0.168
Under 5	75	12	16.0	.151	63	12	19.0	.180
5–9	109	11	10.1	.122	71	8	11.3	.204
10–14	85	7	8.2	.057	58	5	8.6	.113
	Scarlet fever							
All under 15	2,145	505	23.5	1.24	1,919	483	25.2	1.31
Under 5	624	178	28.5	1.00	611	176	28.8	.99
5–9	824	231	28.0	1.89	783	220	30.0	2.02
10–14	697	96	13.8	.82	575	87	15.1	.89
Under 1	76	3	3.9	.07	76	3	3.9	.07
1	105	21	20.0	.47	103	20	19.4	.46
2–3	279	95	34.1	1.13	275	95	34.5	1.13
4–5	340	116	34.1	1.61	323	114	35.3	1.65
6–7	340	102	30.0	2.32	305	97	31.8	2.44
8–9	308	72	23.4	1.61	262	67	25.6	1.76
10–11	306	46	15.0	1.03	256	43	16.8	1.14
12–14	391	50	12.8	.69	319	44	13.8	.74
15–19	422	26	6.2	.21	353	25	7.1	.23
20–24	255	7	2.7	.06	220	7	3.2	.07

[1] "Exposed" means persons in attacked households minus primary cases. If 2 cases were reported as having become sick on the same day (2 or more order 1 cases), the first entry of such an order 1 case of this disease in the list of communicable diseases that occurred during the study year was used as the "primary" case. A sample tabulation indicated that the order of listing was not by age of the case. The use as primary cases of all cases with onset on the same day as the first case does not change the secondary attack rates materially and the age-curve is practically the same as when all order 1 cases are used. Since the inquiry was at the end of the year, dates were not asked but only the "order" of occurrence of the cases. Cases with onset as much as 2 calendar months after the onset of the last preceding case were counted as a new series in the household.

No data are available on the use of antitoxin as a passive immunization to protect household contacts from attack.

in lasting immunity for the patient; therefore, the best medical practice is to immunize the child artificially within a few months after recovery.

The scarlet fever situation where few cases are treated with antitoxin is quite different. Applying age-specific scarlet fever incidence rates for children with no prior case or immunization to children who had suffered an attack prior to the study year, there was an expectancy of

[21] These children may or may not have had artificial immunization before or after the diphtheria case.

149 cases among the 11,454 children under 15 years, as compared with 38 actual cases, a difference which is statistically significant ($P=<0.0001$). Similarly, age-specific scarlet fever secondary attack rates of children with no prior case or immunization were applied to children with a history of a prior case who were exposed during the study year to a case in the household; the expectancy was 39 cases among the 181 children under 15 years, as compared with 10 actual cases—a difference which is statistically significant ($P=<0.0001$).

REPORTING OF COMMUNICABLE DISEASE TO HEALTH DEPARTMENTS

In the 28 large cities covered by the Communicable Disease Study, cases with onset within the study year as recorded in the family canvasses were checked by name with the files of cases reported to the city health department by attending physicians, clinics, and hospitals. Table 16 shows the results of this check for diphtheria and other communicable diseases.

Of the 227 diphtheria cases recorded in the Communicable Disease Study, 70 percent were found to have been reported to the health department, varying from 78 in the Northeast to 64 in the South. The proportion of scarlet fever cases reported was almost identical with diphtheria, the total being 73 percent. The level of reporting in the four more common diseases of whooping cough, measles, mumps, and chickenpox falls to about one-fourth of the cases, with only 15

TABLE 16.—*Percentage of cases of diphtheria and other communicable diseases recorded in the family survey that were located by name in the city health department files of reported cases—canvassed households in 28 large cities,[1] 1935–36*

Geographic section [2]	Percentage of cases reported to health department							Total number of cases recorded in family survey which were checked against health department files [1]						
	Diphtheria	Scarlet fever	Whooping cough	Measles	German measles	Mumps	Chickenpox	Diphtheria	Scarlet fever	Whooping cough	Measles	German measles	Mumps	Chickenpox
All cities	70	73	26	27	15	23	26	227	2,315	4,065	7,450	5,295	4,851	5,902
Northeast	78	76	24	26	18	23	26	45	874	1,344	2,866	1,796	1,649	1,922
North Central	61	68	29	29	13	28	27	38	668	1,536	1,946	1,403	1,181	2,220
Intermediate	77	75	28	28	15	25	27	53	263	361	443	475	1,007	628
South:														
Total	64	67	4	9	1	1	3	83	91	392	929	719	525	400
White	68	68	6	10	1	1	3	57	84	295	749	687	373	332
Colored	54	(3)	0	6	0	0	3	26	7	97	180	32	152	68
West	(3)	76	38	38	25	30	38	8	419	432	1,266	902	489	732

[1] Cases recorded in the canvass as occurring outside of the city (while on vacation, prior to coming to the city, etc.) are excluded from the computation. The following cities where checking was not possible are also excluded: Whooping cough not reportable in Houston and Dallas; no file of cases in Atlanta and Richmond. Measles: not reportable in Houston; no file of cases in Flint for part of year. German measles not reportable in Houston. Mumps: not reportable in Buffalo, Syracuse, New Orleans, Houston, and Dallas; no file of cases in Richmond, Spokane, and Atlanta. Chickenpox: not reportable in Houston and Dallas; no file of cases in Richmond and Atlanta.

[2] See note to table 2 for cities included in each section.

[3] No percentage computed—less than 10 total cases.

percent of German measles cases reported. There are differences between the geographic sections but they are not large except for the South where not more than 10 percent of any of these five common diseases were reported, and the proportions reported for German measles, mumps, and chickenpox were 1 to 3 percent.

The results of such a check of individual names represents a minimum estimate of the completeness of reporting. Any name that was wrongly recorded on either the family survey or the physician's report to the health department may have resulted in counting the case as unreported. Moreover, a report on the family survey of a case that was not diphtheria and consequently not reported by the attending physician would also cut down the estimate of the percentage of cases reported.

Another method of calculating completeness of reporting is to estimate the total cases in each surveyed city from the canvassed family data and compare this figure with the actual reports to the health department. The cases from the Communicable Disease Study and the National Health Survey were combined for this purpose. The National Health Survey covered 27 of the 28 large cities included in the Communicable Disease Study with samples that were roughly twice the size of the Communicable Disease samples.[22] Applying this method to each of the 28 cities and adding to get totals for geographic sections, the percentage of the expected cases that were actually reported was computed. For the whole group of cities this latter method indicates that 90 percent of the diphtheria cases were reported. Thus the actual percentage reported would be estimated to lie between the 70 percent obtained by the name check and the 90 percent obtained by the estimate of total incidence. In the several sections, the estimate of the percentage reported would be from 78 to 83 percent in the Northeast; from 61 to 75 in the North Central; from 77 to 82 in the Intermediate; and from 64 to 100 in the South.[23]

IMMUNIZATIONS SINCE 1935–36

Diphtheria immunizations by or under the auspices of health departments are reported annually to the Public Health Service and the Children's Bureau.[24] Although the data are admittedly rough, sometimes representing the numbers of injections instead of the numbers of children immunized, and never distinguishing between original and second or later immunizations, they afford some approximate indication of the trend in immunizations since the time of this survey.

[22] No blocks were canvassed by both surveys, so there is no duplication of cases when the two studies are combined. Baltimore was included in the Communicable Disease Study but not in the Health Survey tabulations.

[23] In the West there were only eight cases in the name check, six of which were found; the second method indicated that nearly all of the cases were reported.

[24] The U. S. Children's Bureau kindly furnished a tabulation of current diphtheria immunizations for children of certain ages, as reported by health departments.

The most useful base for an immunization rate computed from these data seems to be the number of live births; the annual number of births represents an annual increment of unimmunized persons to the population. A correction for neonatal deaths could be made, but with these rough immunization data and no information on interstate migration, this does not seem necessary. It must be remembered also that these data refer to immunizations in both urban and rural parts of the States, whereas the survey data included in this paper refer only to cities over 100,000 in population.

The reported immunizations during the 7 years 1938–44 amounted to 49 percent of the live births within this period. By no means all persons immunized were infants under 1 year of age, but regardless of age at immunization this rate would mean that the numbers of immunizations during this period amounted to only about half of the number of unimmunized infants added to the population. In the large cities surveyed in this study, 48 percent of the children under 15 years of age had been immunized (7). If it be assumed that most of the reported immunizations were done for children under 15 years of age, and that the rate in the whole population was similar to that in the large cities, then it appears that current immunizations served only to keep up to the 1935–36 level of about half of the children having been immunized. However, it is likely that less than half of the rural children had been immunized, so it seems probable that there has been

TABLE 17.—*Current immunizations done by or under the auspices of health departments and reported to the Public Health Service and Children's Bureau, 1938–44*

Geographic section	Total 1938–44	1944	1942–43	1940–41	1938–39	Total 1938–44	1944	1942–43	1940–41	1938–39
	Annual current immunizations [1] at all ages per 100 live births					Number of immunizations [1] of all ages done in specified period (in thousands)				
All sections	49.0	42.0	50.5	47.3	53.6	8,233	1,196	2,817	2,021	2,200
Northeast	28.9	23.1	29.0	30.5	32.9	908	143	357	205	203
North Central	41.0	35.3	49.2	35.7	39.6	2,102	294	815	464	530
South	63.1	53.1	64.0	61.0	70.4	4,126	558	1,298	1,089	1,181
Mountain	68.3	59.1	68.8	61.6	80.1	454	61	139	113	141
Pacific	48.4	57.1	45.2	45.3	49.8	643	140	208	150	145
	Percent of current immunizations done for children under 5 years of age					Percent of current immunizations done for children under 1 year of age				
All sections	42.0	42.3	41.6	43.2	41.0	12.7	13.4	12.7	13.5	11.7
Northeast	48.1	51.2	46.8	46.0	50.5	18.7	21.3	18.6	18.2	17.7
North Central	25.1	28.3	27.3	23.2	21.9	4.9	5.7	6.1	3.6	4.0
South	51.7	52.4	51.2	53.8	50.0	17.0	17.9	16.9	18.4	15.4
Mountain	34.0	31.5	36.6	36.5	30.4	6.8	8.4	7.5	7.1	5.3
Pacific	31.0	26.7	32.4	32.2	31.8	5.5	5.6	5.3	6.1	5.2

[1] Excludes a few immunizations of unknown age. Because no reports were available for certain years, the following States are not included: Massachusetts, all periods; Pennsylvania, prior to 1942; Missouri, 1940–41.

considerable increase in the proportions immunized since this canvass was made.

Total immunizations as reported by health departments per 1,000 live births have been computed by geographic section for 4 periods: 1938–39, 1940–41, 1942–43, and 1944 (table 17). Although no definite trend is seen, it is true that in each section except the Pacific the immunization rate was less in 1944 than that for the 7 years combined. Comparing the geographic sections for all years combined, the rates in the South and Mountain sections were considerably above the other three; but in 1944 the rate for the Pacific section was nearly as high. The low rate in the Northeast may reflect the high proportion of children already immunized in that section rather than a lagging in immunizations.

There is considerable difference in the ages at which immunizations were done in the several sections. Taking the 7 years as a whole, 52 percent of the immunizations reported by health departments in the South were done when the child was under 5 years of age, with 17 percent under 1 year of age. In 1940–41, 54 percent of the immunizations in the South were done below 5 years of age. The section which most nearly approaches this record is the Northeast with a total of 48 percent under 5 years and 19 percent under 1 year, with 51 percent under 5 and 21 percent under 1 year in 1944.

To summarize, these reports from health departments on immunizations appear to indicate that the South and Mountain regions, where the decreases in case and death rates are lagging behind other sections, are currently doing more immunization work which tends to bring them nearer the immunization status of other geographic sections.

WHERE CURRENT IMMUNIZATIONS IN SURVEYED POPULATION WERE DONE

Considering all white surveyed children under 15 years in all geographic sections, 56 percent of the current diphtheria immunizations were reported as having been done in public clinics. For children under 5 years old, the figure was 44 percent in clinics, but in both the school ages of 5–9 and 10–14, 64 percent of the immunizations were done in clinics, dropping back to 53 percent at 15–19 years and 42 percent for adults aged 20 years and above. While there are variations, this general picture of more immunizations in clinics at the school ages is repeated in each geographic section (table 18).

Considering white children of all ages under 15 years, the West is at the top with 66 percent of the immunizations done in clinics, and the South at the bottom with 45 percent. Some confusion in reporting may have resulted from the practice in local health departments of doing immunizations upon request rather than in a formal clinic, or of

the health department furnishing the toxoid at a nominal price to private practitioners who do the immunizing.

Economic status plays an important part in the matter of who does the immunizations. Among families on relief during the study year, 71 percent of the diphtheria immunizations of children under 15 years of age were done in clinics, and among nonrelief families with less than

TABLE 18.—*Percentage of diphtheria and scarlet fever immunizations during the study year that were done in public clinics, by color, geographic section, and income—canvassed families in 28 large cities, 1935–36*

Geographic section, annual family income, and color	Percent of immunizations done in public clinics [1]					Total number of immunizations during year [2]				
	All ages under 15 [3]	Under 5	5–9	10–14	15–19	All ages under 15 [3]	Under 5	5–9	10–14	15–19
	Diphtheria									
All incomes:										
White:										
All sections	56.1	44.2	64.5	63.6	52.9	11,523	4,701	5,064	1,758	454
Northeast	52.8	42.8	62.6	52.6	46.6	3,778	1,637	1,684	457	118
North Central	58.6	43.8	68.7	70.9	61.4	3,578	1,496	1,570	512	166
Intermediate	60.3	51.1	67.4	72.4	51.3	1,565	758	565	242	39
South	44.6	40.4	46.7	47.6	46.7	1,367	499	568	300	45
West	66.2	43.5	71.9	78.4	48.8	1,235	311	677	247	86
Colored:										
All sections [4]	71.8	76.3	72.6	64.8	67.5	1,762	578	729	455	80
North	68.0	62.7	69.7	73.6	64.7	678	236	317	125	34
South	74.1	85.7	74.8	61.4	69.6	1,074	336	409	329	46
All geographic sections:										
White:										
Relief	71.2	71.0	72.4	68.2	68.0	2,468	822	1,177	469	122
Under $1,000	65.2	60.1	68.3	67.5	61.6	1,948	695	890	363	86
$1,000–$1,500	58.0	46.4	66.6	66.1	41.7	3,387	1,427	1,503	457	108
$1,500–$3,000	42.2	26.4	56.1	55.6	43.8	3,266	1,519	1,335	412	121
$3,000 and over	20.6	6.8	34.3	40.8	42.9	389	206	134	49	14
Colored:										
Relief	73.6	75.8	73.8	71.0	65.8	956	293	404	259	38
Nonrelief	69.7	77.3	71.1	56.6	69.0	803	282	325	196	42
	Scarlet fever									
All incomes:										
White:										
All sections	36.6	29.2	39.2	40.0	36.1	467	130	237	100	83
Northeast	45.3	46.2	44.7	46.2	25.0	181	52	103	26	16
North Central	37.3	21.4	38.0	51.2	57.1	177	42	92	43	28
South and Intermediate	23.1	33.3	15.4	18.2	-------	39	15	13	11	10
West	20.0	-------	34.5	20.0	34.5	70	21	29	20	29
All geographic sections:										
White:										
Relief	60.5	35.7	62.2	70.0	61.1	81	14	37	30	18
Under $1,000	60.7	52.6	61.5	72.7	55.6	56	19	26	11	9
$1,000–$1,500	45.5	46.9	48.1	30.8	23.1	99	32	54	13	13
$1,500–$3,000	22.2	16.3	26.4	19.4	25.0	171	49	91	31	36
$3,000 and over	8.6	-------	14.3	6.7	28.6	58	15	28	15	7

[1] The total immunizations under 15 years tabulated as done by clinics include 177 for diphtheria and 1 for scarlet fever reported as done by nurses, presumed to be in clinics or representing schools and health departments.

[2] In this table a second series of inoculations within the one study year is counted as a second immunization; in other tables immunizations refer to children receiving one or more series of inoculations of a given kind.

[3] Age last birthday as of end of study year.

[4] All sections includes the few colored in the West. For colored, *North:* Northeast and North Central; *South:* South and Intermediate.

$1,000 annual income, the figure was 65 percent, as compared with 21 percent for families with incomes of $3,000 or over. Among children under 5 years in families with incomes of $3,000 or above, only 7 percent of the current immunizations were done in public clinics, but at the school ages of 5–9 and 10–14 years the figures were 34 and 41 percent, respectively.

Among colored children under 15 years of age 72 percent of the current diphtheria immunizations were done in public clinics, as compared with 56 percent among white children. The figure for colored children in northern cities (Northeast and North Central) was 68 percent as compared with 74 percent for southern cities (South and Intermediate). In the South the proportion done in clinics was 77 percent for children in colored families on relief, and 71 percent for those not on relief; in the North the corresponding figures were 69 and 67 percent, respectively.

Scarlet fever immunizations during the study year amounted to about 3 per 1,000 white children under 15 years of age, as compared with 72 for diphtheria immunizations. For the whole surveyed population under 15 years of age, 37 percent of scarlet fever immunizations were done in clinics, as compared with 56 percent for diphtheria; the lower percentages for scarlet fever were true for each income group.

SUMMARY

An examination of the trend of diphtheria and scarlet fever incidence, mortality, and case fatality in certain States indicates a sharp break in diphtheria incidence and mortality between 1925 and 1930 with no marked change in the trend of case fatality. Scarlet fever mortality and case fatality have shown regular declines, but case incidence has shown no change or a slightly upward trend. Thus the decline in diphtheria mortality has resulted from a decrease in case incidence, but the decline in scarlet fever mortality has resulted from a decrease in case fatality.

An examination of the trend of diphtheria incidence and mortality in different geographic sections indicates that the decline in both cases and deaths has been slower in the Southern and Mountain States than in other sections. Prior to about 1925 diphtheria incidence and mortality was higher in the North than in the South, but after about 1930 rates in the South were definitely above other sections.

Data on the proportion of children of specific ages who had been immunized against diphtheria were collected in a house-to-house canvass in 28 large cities some years ago. It was found that the proportion of children of specific ages who had been immunized was less in the South than in other sections, particularly among children of the school ages. An analysis of the years since first immunization

indicated that, on the average, the immunized children in the South had been immunized for a shorter period than in other sections, indicating that the procedure got under way at a later date in the South.

The number of cases of diphtheria in the relatively small surveyed population was not sufficient for reliable rates but incidence based on cases reported to health departments was computed for each of the 28 surveyed cities. Using the proportion of children who had been immunized as obtained in the survey and these reported case rates, it was found that there was considerable correlation between diphtheria incidence and the proportion immunized. The correlation was −0.70 between reported diphtheria incidence (adjusted for age) and the proportion of children of the ages 5–14 who had been immunized, with the proportion of children under 5 years who had been immunized held constant.

Certain types of data not readily available outside of surveys have been summarized. Diphtheria incidence was higher for boys than girls in the several ages under 5 years but above 5 years the incidence was consistently higher for females. In contrast there were no consistent sex differences in the incidence of scarlet fever.

Some years ago diphtheria case and death rates were rather consistently lower for Negroes than white persons. Considering all of the surveyed cities of 100,000 or over, the incidence among Negroes was greater than among the white, but this was not true in the South. In the matter of mortality, the Negro diphtheria rates for the country as a whole and for cities of 100,000 or over in the South are all rather consistently higher in the several ages than the corresponding rates for white children.

Information reported to Federal agencies by health departments indicates no great change in the annual numbers of diphtheria immunizations done over the past 7 years, although there is a suggestion of some drop in 1944. The South shows rather consistently higher current immunization rates than other sections, with a consistently higher proportion of the immunizations done for children under 5 years of age. However, diphtheria incidence and mortality are still high in the South, particularly in the rural areas.

A check by name on the reporting of diphtheria cases to health departments of the surveyed cities indicated that about 70 percent were reported, varying in the different sections from 64 in the South to 78 in the Northeast. The level of reporting of scarlet fever was approximately the same but for the more common childhood diseases of whooping cough, measles, mumps, and chickenpox, only about one-fourth of the cases were reported. Other methods of estimating the completeness of reporting indicate somewhat higher percentages of diphtheria cases reported to health departments, particularly in the South.

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(32) U. S. Bureau of Census: Mortality in the United States, published annually, Government Printing Office.
(33) U. S. Bureau of Census: Mortality summary for diphtheria, Vital Statistics Special Reports, 16: 25 (July 15, 1942) (processed).
(34) U. S. Public Health Service: Notifiable diseases in States, published annually as supplements to the Public Health Reports; 1943 supplement is No. 182.
(35) Wheeler, R. E.; Doull, J. A.; and Frost, W. H.: Antitoxic immunity to diphtheria in relation to tonsillectomy. Am. J. Hyg., 14: 555–559 (November 1931).

DEATHS DURING WEEK ENDED JANUARY 19, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 19, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	10,401	9,656
Average for 3 prior years	10,091	
Total deaths, first 3 weeks of year	33,999	29,354
Deaths under 1 year of age	577	658
Average for 3 prior years	655	
Deaths under 1 year of age, first 3 weeks of year	1,832	1,911
Data from industrial insurance companies:		
Policies in force	67,111,222	66,938,620
Number of death claims	16,659	12,974
Death claims per 1,000 policies in force, annual rate	12.9	10.1
Death claims per 1,000 policies, first 3 weeks of year, annual rate	11.1	9.9

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 26, 1946

Summary

The incidence of influenza declined during the week in all sections of the country except that in the East North Central area, which reported 350 cases as compared with 347 last week. A total of 14,481 cases was reported for the country as a whole, as compared with 21,110 for the preceding week and a 5-year (1941–45) median of 4,899. Of the 12 States reporting more than 200 cases each, only 4 reported increases. These States (Georgia, Oklahoma, Colorado, and California) reported an aggregate for the week of 1,334 cases, as compared with 1,067 last week. The other 8 States, all in the South Atlantic, South Central, and Mountain areas, reported an aggregate of 11,837 cases, as compared with 17,322 for the preceding week. The total to date this year is 116,267 as compared with 17,103 and 261,981, respectively, for the corresponding periods in 1945 and 1944, and a 5-year median of 17,421. For the 10-week period to date since November 18, 1945, a total of 454,833 cases has been reported, as compared with 587,193 and 32,620, respectively, for the corresponding periods of 1943–44 and 1944–45.

For other diseases included in the table, the totals for the first 4 weeks of the year (last year's figures in parentheses) are as follows: Anthrax 4 (5), diphtheria 1,724 (1,384), the dysenteries (combined) 2,110 (3,617), infectious encephalitis 31 (23), leprosy 1 (6), measles 20,285 (5,362), meningococcus meningitis 907 (953), poliomyelitis 210 (147), scarlet fever 10,939 (18,976), smallpox 29 (34), tularemia 104 (133), typhoid fever 169 (208), endemic typhus fever 246 (292), undulant fever 254 (268), whooping cough 7,336 (8,985).

A total of 10,157 deaths was recorded for the week in 93 large cities of the United States, as compared with 10,401 last week, 9,734 and 10,068, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 10,024. The total to date this year is 44,156, as compared with 39,088 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended Jan. 26, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that although none was reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945	
NEW ENGLAND												
Maine	3	3	0	1	------	1	27	2	34	2	1	1
New Hampshire	0	1	0	2	------	------	5	------	9	1	0	0
Vermont	0	1	1	53	------	------	3	------	19	1	0	0
Massachusetts	0	3	3	------	------	------	181	60	341	2	3	4
Rhode Island	0	0	0	2	------	------	1	------	22	1	0	1
Connecticut	1	2	1	43	7	14	27	38	107	3	2	2
MIDDLE ATLANTIC												
New York	11	8	12	[1] 28	[1] 3	[1] 14	993	57	928	25	27	27
New Jersey	6	1	4	32	3	24	67	14	431	7	4	4
Pennsylvania	14	12	8	16	1	1	738	42	1,272	16	17	15
EAST NORTH CENTRAL												
Ohio	40	8	8	31	7	15	59	22	152	10	12	5
Indiana	21	6	8	104	14	50	71	8	126	4	3	3
Illinois	6	3	14	14	1	13	556	45	273	24	16	7
Michigan [2]	13	19	6	8	2	2	628	18	141	9	3	3
Wisconsin	1	1	1	193	26	93	76	37	286	4	8	8
WEST NORTH CENTRAL												
Minnesota	6	8	5	2	3	3	5	4	19	3	1	1
Iowa	1	4	4	------	------	6	17	22	109	3	1	1
Missouri	7	5	5	13	5	5	235	10	55	4	7	7
North Dakota	1	2	1	40	1	14	2	2	42	0	0	0
South Dakota	0	0	0	------	------	------	48	9	39	2	0	0
Nebraska	1	3	3	23	2	3	10	14	19	1	1	1
Kansas	15	3	5	115	1	10	204	13	153	1	1	1
SOUTH ATLANTIC												
Delaware	0	1	1	------	------	------	2	43	12	1	1	1
Maryland [2]	20	9	9	15	16	16	32	21	32	2	1	4
District of Columbia	0	0	1	5	------	4	8	7	11	2	0	3
Virginia	13	12	8	1,465	385	567	124	22	168	6	5	6
West Virginia	4	4	4	67	14	34	84	11	54	4	2	2
North Carolina	12	9	11	------	------	45	92	20	87	3	7	7
South Carolina	11	19	8	1,567	810	810	54	17	25	0	1	1
Georgia	6	13	7	216	52	183	34	9	63	1	6	5
Florida	10	1	2	1	2	10	42	35	35	3	7	3
EAST SOUTH CENTRAL												
Kentucky	12	7	7	189	7	19	305	7	97	5	5	5
Tennessee	8	3	3	135	58	105	86	24	48	6	8	3
Alabama	2	12	12	757	266	644	20	4	62	6	13	7
Mississippi [2]	9	5	7	------	------	------	------	------	------	2	5	5
WEST SOUTH CENTRAL												
Arkansas	14	6	8	429	121	267	102	90	90	11	25	2
Louisiana	6	9	8	1,202	12	26	13	10	32	4	4	4
Oklahoma	10	7	9	543	192	192	55	7	7	0	1	1
Texas	60	57	53	5,035	2,138	2,138	346	173	173	8	8	8
MOUNTAIN												
Montana	1	1	2	12	38	38	10	5	77	0	0	0
Idaho	2	2	0	79	1	1	10	------	25	0	0	0
Wyoming	0	0	0	1	------	43	87	1	20	1	0	0
Colorado	4	10	9	214	30	113	95	6	166	0	3	3
New Mexico	3	6	3	15	5	5	2	8	21	1	0	0
Arizona	3	0	4	203	136	155	5	9	106	0	1	1
Utah [2]	0	1	1	1,179	2	15	76	33	33	0	0	0
Nevada	0	0	0	------	------	------	1	1	1	0	0	0
PACIFIC												
Washington	7	10	6	------	------	3	275	49	82	4	6	5
Oregon	2	6	4	71	10	35	40	42	87	2	5	3
California	38	28	28	361	20	155	759	430	430	21	21	21
Total	404	331	331	14,481	4,391	4,899	6,712	1,501	10,887	216	242	242
4 weeks 1946	1,724	1,384	1,355	116,267	17,103	17,421	20,285	5,362	36,328	907	953	953

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Jan. 26, 1946, and comparison with corresponding week of 1945 and 5-year median—Continued.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945		Jan. 26, 1946	Jan. 27, 1945	
NEW ENGLAND												
Maine	0	1	0	31	49	21	0	0	0	0	0	0
New Hampshire	0	0	0	12	21	14	0	0	0	0	0	0
Vermont	0	0	0	11	8	8	0	0	0	0	0	0
Massachusetts	0	1	1	178	360	324	0	0	0	2	1	1
Rhode Island	0	0	0	6	13	13	0	0	0	0	0	0
Connecticut	1	0	0	33	85	65	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	2	6	2	404	465	416	0	0	0	0	2	3
New Jersey	0	0	0	82	135	135	0	0	0	0	2	1
Pennsylvania	0	4	1	254	324	324	0	0	0	2	35	5
EAST NORTH CENTRAL												
Ohio	1	3	1	249	392	318	0	0	0	0	1	1
Indiana	0	1	1	85	177	126	1	0	2	0	2	3
Illinois	2	2	2	196	430	257	0	0	0	6	0	1
Michigan [2]	2	0	0	110	279	207	0	0	1	2	0	1
Wisconsin	0	1	0	130	145	214	0	0	0	1	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	57	95	93	0	0	0	1	0	0
Iowa	0	0	0	55	61	61	0	0	1	0	0	1
Missouri	2	0	0	60	143	93	0	0	0	0	0	0
North Dakota	0	0	0	13	7	13	0	0	0	0	1	0
South Dakota	0	0	0	34	24	32	0	0	0	0	1	0
Nebraska	0	0	0	59	67	34	0	0	0	0	0	0
Kansas	1	0	0	75	146	87	1	0	1	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	4	6	8	0	0	0	0	0	0
Maryland [2]	0	0	0	63	157	83	0	0	0	1	0	1
District of Columbia	0	0	0	12	70	29	0	0	0	2	0	0
Virginia	0	0	0	74	86	50	0	0	0	2	2	2
West Virginia	1	2	0	30	75	48	0	0	0	0	0	0
North Carolina	0	1	1	38	74	63	0	0	0	0	2	0
South Carolina	0	1	1	9	6	6	0	0	0	1	3	1
Georgia	1	0	0	15	36	33	0	0	0	4	3	3
Florida	4	2	1	11	11	11	0	0	0	2	2	1
EAST SOUTH CENTRAL												
Kentucky	0	0	0	44	70	66	0	2	0	0	0	0
Tennessee	0	0	0	31	87	81	1	0	0	1	2	3
Alabama	0	0	0	9	25	18	0	0	0	1	0	1
Mississippi [2]	3	0	0	19	10	10	1	0	1	0	1	1
WEST SOUTH CENTRAL												
Arkansas	0	1	0	12	63	7	0	1	1	0	0	1
Louisiana	2	0	0	8	27	10	0	0	0	0	3	4
Oklahoma	2	0	0	15	22	24	0	0	0	0	0	1
Texas	4	0	1	74	163	64	0	0	1	5	3	3
MOUNTAIN												
Montana	0	0	0	8	17	24	0	0	0	0	0	0
Idaho	0	0	0	14	64	14	0	0	0	1	3	0
Wyoming	0	0	0	7	5	12	0	0	0	0	0	0
Colorado	0	1	1	40	73	68	2	0	0	0	0	0
New Mexico	0	0	0	30	29	7	0	1	1	0	1	1
Arizona	0	0	0	12	16	7	0	0	0	0	0	0
Utah [2]	0	3	0	39	53	53	0	0	0	0	0	0
Nevada	0	0	0	0	7	0	0	0	0	0	0	0
PACIFIC												
Washington	5	3	1	35	76	29	0	0	0	0	4	1
Oregon	2	0	0	34	44	20	0	0	0	1	0	0
California	*13	3	3	302	329	191	1	0	1	4	2	2
Total	48	36	31	3,123	5,127	3,746	7	4	24	40	76	72
4 weeks 1946	*210	147	136	10,939	18,976	14,150	29	34	67	169	208	252

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts, 2; Georgia, 3; Texas, [illegible].

*Correction: Week ended Jan. 5, 1946, poliomyelitis, California, 11 cases (instead of 1).

Telegraphic morbidity reports from State health officers for the week ended Jan. 26, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Jan. 26, 1946	Whooping cough: Week ended— Jan. 27, 1945	Whooping cough: Median 1941–45	Week ended Jan. 26, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	26	70	47								1
New Hampshire	10	4	9								
Vermont	21	54	34								
Massachusetts	89	171	173								
Rhode Island	42	28	24								
Connecticut	63	67	71	1	1						2
MIDDLE ATLANTIC											
New York	215	219	351	2	6		2		1		3
New Jersey	77	106	126	1		1					1
Pennsylvania	124	138	288								
EAST NORTH CENTRAL											
Ohio	101	169	277		3				2		2
Indiana	28	20	22		2	1			1		
Illinois	76	83	108	3	3				1		2
Michigan [2]	109	85	262								
Wisconsin	64	85	149								3
WEST NORTH CENTRAL											
Minnesota	8	40	49	1							3
Iowa	16	2	15								
Missouri	28	1	14			1			2		
North Dakota	2		11								
South Dakota		15	5								3
Nebraska	6	3	3								
Kansas	18	67	66			1			1		4
SOUTH ATLANTIC											
Delaware	10	2	2								
Maryland [3]	27	49	49			1					
District of Columbia	5	6	7								
Virginia	47	45	58			24			3		
West Virginia	22	9	49								
North Carolina	56	108	162						2		
South Carolina	61	53	72	1	4					3	
Georgia	8	14	26							17	3
Florida	12	9	16	4						7	5
EAST SOUTH CENTRAL											
Kentucky	26	30	50				3				2
Tennessee	23	38	38				4		2	4	1
Alabama	15	38	26	1						8	1
Mississippi [2]									2	1	1
WEST SOUTH CENTRAL											
Arkansas	11	17	17	1	1		1				
Louisiana		3	7	1						2	
Oklahoma	10	21	8		1					2	
Texas	110	241	241	6	231	41				11	16
MOUNTAIN											
Montana		19	19								
Idaho	9		5								
Wyoming	1	9	9								
Colorado	20	20	27								
New Mexico	3	4	24		1	2					
Arizona	11	15	15			17					2
Utah [2]	14	23	32								
Nevada											
PACIFIC											
Washington	63	28	49								
Oregon	7	7	16								
California	138	224	224	6	5						5
Total	1,832	2,459	3,846	28	258	89	10	0	17	55	60
Same week, 1945	2,459			26	536	179	6	0	14	49	68
Average, 1943–45	2,774			19	299	96	7	[4] 0	15	[4] 44	
4 weeks: 1946	7,336			163	1,422	525	31	0	104	246	254
1945	8,985			115	2,766	736	23	1	133	292	268
Average, 1943–45	10,645		[4] 15,883	96	1,451	367	31	[4] 0	92	[4] 219	

[2] Period ended earlier than Saturday. [4] 5-year median, 1941–45.

Anthrax: New York 2 cases; Idaho 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 19, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	1	0	------	0	0	0	2	0	0	8
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	3	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	1	0	0	------
Massachusetts:												
Boston	2	0	------	0	14	2	18	0	49	0	1	43
Fall River	0	0	------	0	------	0	2	0	4	0	0	------
Springfield	0	0	------	0	1	0	1	0	13	0	0	1
Rhode Island:												
Providence	0	0	2	0	------	1	0	0	9	0	0	69
Connecticut:												
Bridgeport	0	0	2	0	------	0	2	0	1	0	0	------
New Haven	0	0	5	1	------	0	5	0	1	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	11	1	7	0	12	0	0	36
New York	15	1	43	8	163	18	97	0	137	0	0	58
Rochester	0	0	------	0	14	0	4	0	8	0	0	15
Syracuse	0	0	------	0	433	0	4	0	9	0	0	8
New Jersey:												
Camden	0	0	------	0	4	1	4	0	3	0	0	6
Newark	0	0	10	0	4	2	8	0	12	0	0	16
Trenton	0	0	5	3	------	0	6	0	1	0	0	3
Pennsylvania:												
Philadelphia	5	0	16	7	167	5	38	0	43	0	0	51
Pittsburgh	1	0	------	1	1	3	14	0	9	0	0	3
Reading	0	0	------	1	1	0	2	0	2	0	0	12
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	5	2	9	1	13	0	11	0	0	3
Cleveland	0	0	7	1	1	4	14	0	19	0	1	18
Columbus	6	0	1	1	0	2	3	0	4	0	0	2
Indiana:												
Fort Wayne	0	0	------	0	------	0	1	0	3	0	0	------
Indianapolis	3	0	------	1	16	0	9	0	19	0	0	5
South Bend	0	0	------	0	1	0	0	0	1	0	0	------
Terre Haute	0	0	------	0	------	0	2	0	0	0	0	------
Illinois:												
Chicago	0	0	4	0	360	5	47	1	48	0	0	35
Springfield	1	0	------	0	------	1	8	0	5	0	0	------
Michigan:												
Detroit	2	0	5	2	249	3	8	0	43	0	0	36
Flint	1	0	------	0	39	0	4	0	2	0	0	2
Grand Rapids	0	0	------	1	16	0	2	0	6	0	0	4
Wisconsin:												
Kenosha	0	0	------	0	1	0	0	0	1	0	0	------
Milwaukee	0	0	------	0	17	1	7	0	16	0	0	9
Racine	0	0	2	2	------	0	0	0	2	0	0	2
Superior	0	0	------	0	------	0	0	0	------	0	0	9
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	6	1	0	1	0	6	0	0	4
Minneapolis	4	0	------	1	2	2	8	0	9	0	0	2
St Paul	0	0	------	1	3	0	4	0	10	0	0	2
Missouri:												
Kansas City	4	0	5	1	58	0	8	0	5	0	0	------
St. Joseph	0	0	------	0	70	1	0	0	8	0	0	------
St. Louis	1	0	9	2	11	6	21	1	7	0	0	[illegible]

City reports for week ended Jan. 19, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	------	0	------	1	0	0	0	0	0	------
Nebraska:												
Omaha	0	0	------	0	4	0	5	0	3	0	0	------
Kansas:												
Topeka	0	0	------	0	13	0	1	0	4	0	0	2
Wichita	0	0	1	0	21	0	4	0	6	0	0	3
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	1	3	0	6	0	0	0	0	------
Maryland:												
Baltimore	19	0	7	1	23	2	8	0	15	0	0	6
Cumberland	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	3	1	10	0	6	0	12	0	0	10
Virginia:												
Lynchburg	3	0	------	0	------	0	0	0	2	0	0	2
Richmond	0	0	87	2	2	3	4	0	4	0	0	1
Roanoke	4	0	------	1	------	1	1	0	1	0	0	------
West Virginia:												
Charleston	0	0	------	0	1	2	0	0	1	0	0	------
Wheeling	0	0	------	0	1	0	2	0	2	0	0	------
North Carolina:												
Raleigh	0	0	------	0	5	0	1	0	0	0	0	4
Wilmington	0	0	------	0	0	0	1	0	4	0	0	4
Winston-Salem	0	0	------	0	------	0	0	0	1	0	1	------
South Carolina:												
Charleston	1	0	40	1	1	1	3	0	2	0	0	------
Georgia:												
Atlanta	0	0	42	3	1	0	6	0	3	0	0	------
Brunswick	0	0	------	0	------	0	1	0	0	0	0	------
Savannah	0	0	8	3	------	0	1	0	1	0	0	------
Florida:												
Tampa	2	0	------	0	8	2	2	0	2	0	0	3
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	35	1	4	4	13	0	2	0	0	4
Nashville	0	0	------	2	11	2	5	1	0	0	0	0
Alabama:												
Birmingham	0	0	17	3	------	1	3	0	4	0	0	------
Mobile	0	0	28	2	------	0	0	0	2	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	7	1	------	0	4	0	0	0	0	------
Louisiana:												
New Orleans	5	0	10	2	1	5	10	5	3	0	0	------
Shreveport	1	0	------	1	------	0	4	0	1	0	0	------
Texas:												
Dallas	1	0	1	1	------	0	3	0	7	0	0	1
Galveston	0	0	------	0	------	0	3	0	1	0	0	------
Houston	1	0	------	2	------	0	6	2	4	0	0	------
San Antonio	1	0	3	0	10	1	5	0	2	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	0	0	0	------
Great Falls	0	0	------	0	------	0	0	0	0	0	0	------
Helena	0	0	------	0	------	0	2	0	0	0	0	------
Missoula	0	0	35	0	------	0	1	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	0	0	0	0	0	------
Colorado:												
Denver	2	0	9	0	13	0	11	0	21	0	0	17
Pueblo	0	0	------	0	1	0	0	0	5	0	0	8
Utah:												
Salt Lake City	0	0	------	0	14	0	3	0	10	0	0	1

City reports for week ended Jan. 19, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	6	0	------	1	56	0	8	0	2	0	0	5
Spokane	0	0	------	0	31	0	1	0	6	0	0	7
Tacoma	0	0	------	0	22	1	0	0	5	0	0	12
California:												
Los Angeles	2	0	45	6	50	4	7	1	40	0	0	10
Sacramento	1	0	------	0	14	0	2	0	4	0	0	0
San Francisco	3	0	16	0	112	4	11	3	12	0	1	5
Total	99	1	516	71	2,099	93	522	14	733	0	4	571
Corresponding week, 1945	69	------	183	33	253	------	419	------	1,464	0	11	588
Average, 1941–45	71	------	2,167	[1] 100	[2] 2,716	------	[1] 597	------	1,243	2	18	906

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Dysentery, amebic.—Cases: New York, 1; Dallas, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: Charleston, S. C., 1; San Antonio, 1; Los Angeles, 10.
Dysentery, unspecified.—Cases: New Haven, 1; Baltimore, 1; San Antonio, 10.
Leprosy.—Cases: Los Angeles, 1.
Tularemia.—Cases: New York, 1; Lynchburg, 2; New Orleans, 2.
Typhus fever, endemic.—Cases: Tampa, 1; Nashville, 3; Mobile, 1; Shreveport, 1; Galveston, 1; Houston, 1; San Antonio, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,025,200)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	6.4	0.0	31.8	3.2	48	9.5	92.2	0.0	264	0.0	3.2	385
Middle Atlantic	9.7	0.5	34.3	9.3	369	13.9	85.2	0.0	109	0.0	0.0	96
East North Central	9.1	0.0	14.6	6.1	431	10.3	68.7	0.6	109	0.0	0.6	76
West North Central	17.9	0.0	29.8	9.9	364	19.9	103.4	2.0	105	0.0	0.0	32
South Atlantic	47.6	0.0	307.0	21.3	90	18.1	69.0	0.0	82	0.0	1.6	49
East South Central	0.0	0.0	472.2	47.2	88	41.3	123.9	5.9	47	0.0	0.0	24
West South Central	25.8	0.0	60.3	20.1	32	17.2	100.4	20.1	52	0.0	0.0	6
Mountain	15.9	0.0	349.5	0.0	222	0.0	135.0	0.0	286	0.0	0.0	207
Pacific	19.0	0.0	96.5	11.1	451	14.2	45.9	6.3	109	0.0	1.6	62
Total	15.2	0.2	79.3	10.9	323	14.3	80.2	2.2	113	0.0	0.6	88

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 29, 1945.—During the week ended December 29, 1945, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		7		6	399	46	80	15	72	625
Diphtheria		1	2	12	10	5	1		6	37
Dysentery, bacillary				1						1
German measles				10	17		2	5	5	39
Influenza		6			95	1			4	106
Measles				12	577		4	20	31	644
Meningitis, meningococcus		1		1	1			1		4
Mumps				15	82	16	7	43	19	182
Poliomyelitis				4			1		8	13
Scarlet fever		6	8	22	73	11	2	10	15	147
Tuberculosis (all forms)		6	4	77	64	8	2	21	19	201
Typhoid and paratyphoid fever				12	1			2		15
Undulant fever				2	1					3
Venereal diseases:										
Gonorrhea	1	6	10	87	102	36	29	33	50	354
Syphilis		7	2	81	70	11	4	18	29	222
Whooping cough		17		35	24	14	1	5		96

CUBA

Provinces—Notifiable diseases—4 weeks ended December 29, 1945.—During the 4 weeks ended December 29, 1945, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer			13	14	1	11	39
Chickenpox		1			1		2
Diphtheria		14	5	1		3	23
Leprosy		3				3	6
Malaria	2	13	2	4	18	75	114
Measles					2	1	3
Tuberculosis	16	59	16	44	32	56	223
Typhoid fever	19	34		21	20	45	139
Yaws						1	1

[1] Including Habana city.

JAMAICA

Notifiable diseases—4 weeks ended January 12, 1946.—During the 4 weeks ended January 12, 1946, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	2		Leprosy		2
Chickenpox		13	Puerperal fever		3
Diphtheria	4	2	Scarlet fever	2	1
Dysentery, unspecified	3	8	Tuberculosis, respiratory	28	47
Erysipelas		1	Typhoid fever	21	102

MEXICO

San Luis Potosi—Cerebrospinal meningitis.—According to a report dated January 22, 1946, an outbreak of cerebrospinal meningitis had occurred in San Luis Potosi, Mexico.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Egypt—Alexandria.—For the week ended January 19, 1946, 1 confirmed case of plague was reported in Alexandria, Egypt.

Peru—Tumbes Department.—For the month of December 1945, 13 cases of plague with 3 deaths were reported in Tumbes Department, Peru, including 11 cases of plague with 3 deaths reported in the city of Tumbes. Plague infection in rodents was also reported in the city of Tumbes.

Smallpox

Peru.—For the month of November 1945, 45 cases of smallpox were reported in Peru, including 28 cases reported in Lima Department, and 15 cases reported in Puno Department.

Typhus Fever

Chile.—For the period November 3–30, 1945, 60 cases of typhus fever with 8 deaths were reported in Chile. Provinces reporting the highest incidence are: Santiago, 19 cases, 4 deaths; Concepcion, 7 cases.

Peru.—For the month of November 1945, 96 cases of typhus fever were reported in Peru. Departments reporting the highest incidence are: Ayacucho, 28 cases; Cuzco, 21 cases; Ancash, 20 cases.

Yellow Fever

Bolivia—Santa Cruz Department.—According to a telegraphic report dated January 18, 1946, 39 deaths from suspected yellow fever have occurred in the localities of San Rafael and San Miguel, Santa Cruz Department, Bolivia.

Colombia—Putumayo Commissary—Mocoa—Umbria.—On November 23, 1945, 1 death from yellow fever was reported in Umbria, Mocoa, Putumayo Commissary, Colombia.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

OLUME 61 **FEBRUARY 22, 1946** NUMBER 8

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Public Health Reports

Vol. 61 • FEBRUARY 22, 1946 • *No. 8*

Printed With the Approval of the Bureau of the Budget as Required by Rule 42 of the Joint Committee on Printing

THE INCREASE IN TUBERCULOSIS PROPORTIONATE MORTALITY AMONG NONWHITE YOUNG ADULTS[1]

By J. YERUSHALMY, *Principal Statistician, United States Public Health Service*

A declining mortality rate from a preventable disease is not, in itself, sufficient evidence that satisfactory progress is being achieved, for it is also necessary that the rate of decline be greater than that of the total death rate. Deaths from a disease of which the causative organism and the modes of transmission have been discovered and for which a specific control program has been established, should decline more rapidly than total deaths from all causes, since many of the components of the latter are not, with present knowledge, preventable. Moreover, the ultimate aim in the control of a preventable disease is its complete elimination as a cause of death. Obviously this objective cannot be realized if the rate of decline of its mortality is not more rapid than that of the total death rate. Death is inevitable, and the general death rate cannot be reduced to zero.

Progress achieved in the control of a preventable disease can, therefore, be more adequately evaluated if its mortality rate is supplemented by an index which relates deaths from that cause to total deaths from all causes. Such an index is afforded by proportionate mortality or death ratios, which express the number of deaths from a given cause as a percentage of the number of total deaths. If, over a period of time, the ratios for a specific cause decrease, it indicates that the course of mortality from that cause is more favorable than that of the general death rate; if the ratios remain approximately constant, the two follow an essentially similar course, and if the ratios increase, it is apparent that the trend of mortality from the specific cause is less favorable than that of the general death rate.

Viewed in this light the record of tuberculosis mortality since the beginning of the century is very encouraging, as may be seen in figure 1. The curve of tuberculosis death ratios by age for each decade lies

[1] From the Tuberculosis Control Division.

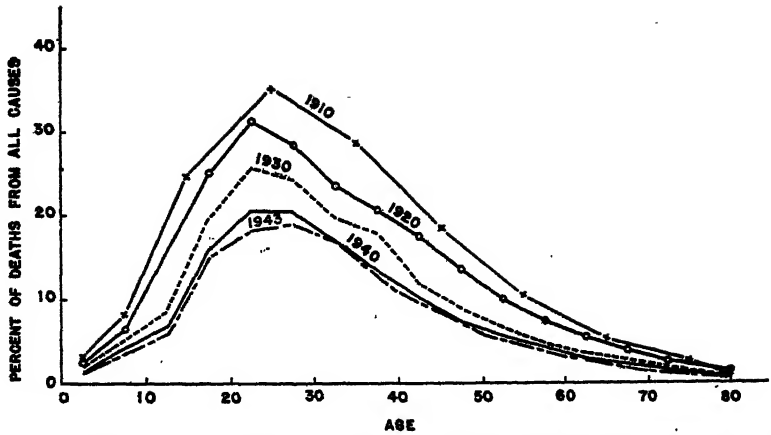

FIGURE 1.—Deaths from tuberculosis (all forms) as percentages of deaths from all causes for all races by age: United States, expanding death registration area, 1910, 1919–21, 1929–31, 1939–41, and 1943.

entirely below that of the preceding one, indicating that for each age-group mortality from tuberculosis declined at a faster pace than did the total death rate. This trend has continued through 1943.

Further analysis of these curves by race and sex reveals, however, that this favorable trend was not common to all race-sex-age groups. (fig. 2). An exception occurs among nonwhite young adults. The tuberculosis proportionate mortality for the age period 15–34 years for both nonwhite males and nonwhite females is higher in recent years than in previous years, reversing a trend which existed for several decades. It is true that the death rate from tuberculosis continues to decline also in these age groups. The rate of decline, however, is slower than that of the death rate from all causes in this group.

An increase in proportionate mortality does not necessarily imply adverse conditions. It may result from a very sharp decrease in mortality from one or more of the numerically important causes of death, a reduction due, for example, to the discovery of efficient new therapeutic agents for these diseases. The purpose of this paper is to investigate in greater detail the trend of proportionate mortality among nonwhite males and females in order to establish whether the increase is due to sharp reductions in mortality from one or more other causes, or whether it indicates an advance warning of an unfavorable situation.

PROPORTIONATE MORTALITY BY SEX AND RACE

In figure 2[2] are shown tuberculosis death ratios by age for white males, white females, nonwhite males, and nonwhite females. It will

[2] The data for this figure are given in "Tuberculosis in the United States, Graphic Presentation, vol. 2 Proportionate Mortality Statistics for States and Geographic Divisions by Age, Sex, and Race", National Tuberculosis Association, 1944, and in "Tuberculosis Mortality in the United States in 1943," Bureau of the Census, Vital Statistics Special Report, vol. 21, No. 2.

be noted that among whites of both sexes the death ratios have been continuously declining at a rapid pace. Each of the curves for the later periods is entirely below those for the preceding ones. The curves for 1943 show that the rate of decrease of tuberculosis mortality continues to be more rapid than that of the total death rate in nearly all age periods.

The situation among nonwhites is not so favorable. Among males the death ratios for the period 1939–41 are lower than those for the

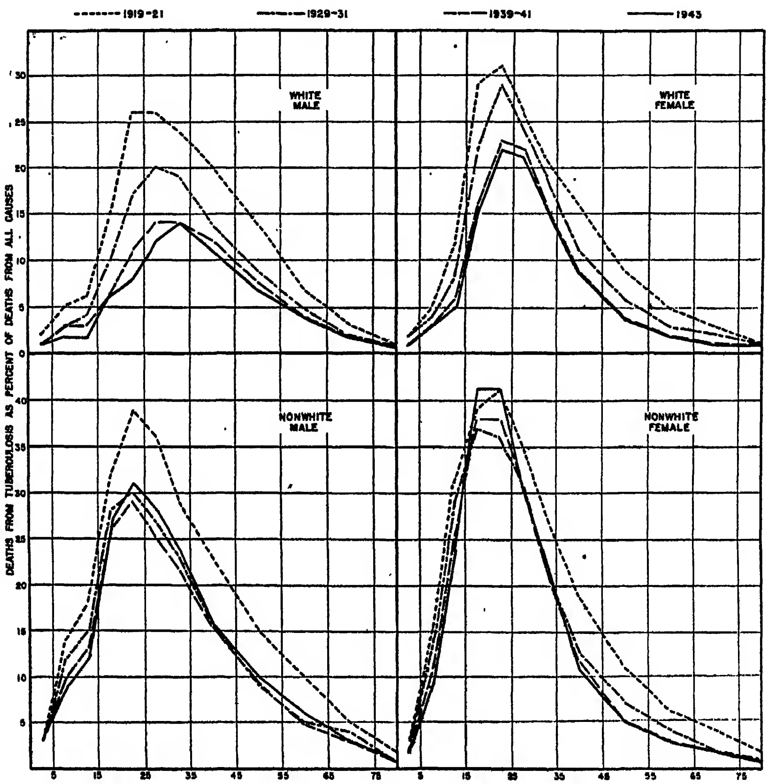

FIGURE 2.—Deaths from tuberculosis (all forms) as percentages of deaths from all causes by age, race and sex: United States, expanding death registration area, 1919–21, 1929–31, 1939–41, and 1943.

preceding two decades. For 1943, however, the ratios for ages 15–34 years are above those for the periods 1939–41 and 1929–31. Among nonwhite females the situation is even worse. Not only are several of the 1943 ratios higher than those for the periods 1939–41 and 1929–31 but they exceed also those for the period 1919–21. In addition, the curve for 1939–41 lies above that for 1929–31 in two age periods.

From these curves it is, therefore, apparent that mortality from tuberculosis among nonwhite young adults has not been declining as

rapidly as mortality from all causes, while for whites of all ages and for nonwhites of most age periods, continued progress is being recorded in tuberculosis mortality as compared with total mortality. It is desirable first to determine whether this reversal in the trend of proportionate mortality from tuberculosis among nonwhite young adults is of recent origin and attributable to the war situation, or whether this reversal had taken place before the outbreak of the war.

In table 1 are shown tuberculosis death ratios from 1933–43, for nonwhite males and for nonwhite females. The data for the age group 15–34 are illustrated in figure 3. It may be seen that in almost every case the direction of the curves for proportionate mortality is downward until around 1937. Beginning with 1938 the tuberculosis death ratios exhibit a very definite upward movement.

TABLE 1.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes among nonwhites by age and sex, United States, 1933–43*

Sex and year	Age												
	All ages	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–44	45–54	55–64	65–74	75 and over
Nonwhite male													
1933	11.3	2.5	11.6	14.4	27.6	29.7	27.7	24.5	18.0	10.3	6.1	3.7	1.5
1934	10.1	2.3	9.8	13.7	26.6	27.5	26.0	21.7	16.1	9.3	5.4	3.3	1.4
1935	10.0	2.3	10.9	13.0	21.5	26.9	23.9	22.3	15.9	9.3	5.3	3.2	1.0
1936	9.7	1.9	9.9	13.4	23.8	25.2	24.2	21.7	15.4	9.0	5.3	2.6	1.1
1937	9.5	2.1	9.1	13.9	22.8	25.9	22.7	21.5	16.0	8.5	5.3	2.7	1.2
1938	9.5	2.1	9.3	10.7	25.0	28.8	24.5	22.0	15.4	8.9	5.5	2.9	1.1
1939	9.3	2.2	9.8	11.8	25.9	28.4	25.2	22.1	16.2	9.3	4.9	2.6	1.0
1940	9.2	2.0	10.0	12.6	26.8	29.5	26.1	21.3	16.3	9.3	5.1	2.7	1.0
1941	9.1	2.0	10.9	13.8	25.3	28.6	24.8	22.8	16.2	9.4	4.9	2.6	1.1
1942	9.4	2.1	9.7	12.7	25.3	30.2	27.5	23.5	16.2	9.5	5.4	2.7	1.3
1943	9.0	1.9	8.8	11.7	26.5	31.1	27.8	24.3	15.8	9.5	5.5	2.8	1.2
Nonwhite female													
1933	11.9	2.7	13.0	26.3	38.6	38.2	32.5	22.8	13.3	6.8	3.9	2.4	1.2
1934	10.8	2.4	12.5	26.6	36.5	35.4	30.0	21.5	12.3	6.3	3.6	2.0	.9
1935	10.4	2.5	10.6	23.7	35.6	33.4	27.2	21.2	12.4	5.7	3.2	2.0	.8
1936	10.1	2.3	10.1	25.8	34.4	34.4	27.3	20.0	11.7	5.5	3.1	1.9	.7
1937	10.1	2.5	11.0	25.5	35.4	33.4	27.8	20.5	11.8	5.9	3.1	1.9	.8
1938	10.1	2.5	10.5	23.8	34.5	36.6	29.9	21.1	12.3	5.3	3.2	1.8	.9
1939	9.8	2.6	11.8	25.6	37.0	36.3	31.1	20.5	11.4	5.4	3.0	1.8	.8
1940	9.3	2.3	10.2	25.5	37.7	37.5	30.7	21.3	11.5	5.1	2.8	1.4	.5
1941	9.4	2.3	10.3	25.2	39.0	39.7	32.1	22.9	11.6	5.0	2.9	1.4	.6
1942	9.3	2.1	10.8	27.3	40.6	41.4	32.7	22.2	11.3	5.2	2.8	1.5	.7
1943	8.6	2.1	9.3	23.5	40.6	40.7	30.9	22.0	10.7	5.0	2.7	1.8	.5

Therefore, it appears that a reversal of the trend in proportionate mortality took place around 1938. More specifically, it seems that tuberculosis mortality had been declining at a faster rate than total mortality in these ages, until around 1935.[3] The rate of decline during the period 1935 to 1937 was essentially the same as that for the total death rate. Beginning with 1938 and for every year thereafter, the decrease in tuberculosis mortality was less than the decline in total mortality.

[3] Although the curves in figure 3 are not shown prior to 1933, figure 2 indicates that there was a steady decrease in the tuberculosis death ratios for nonwhites from 1920 to 1930.

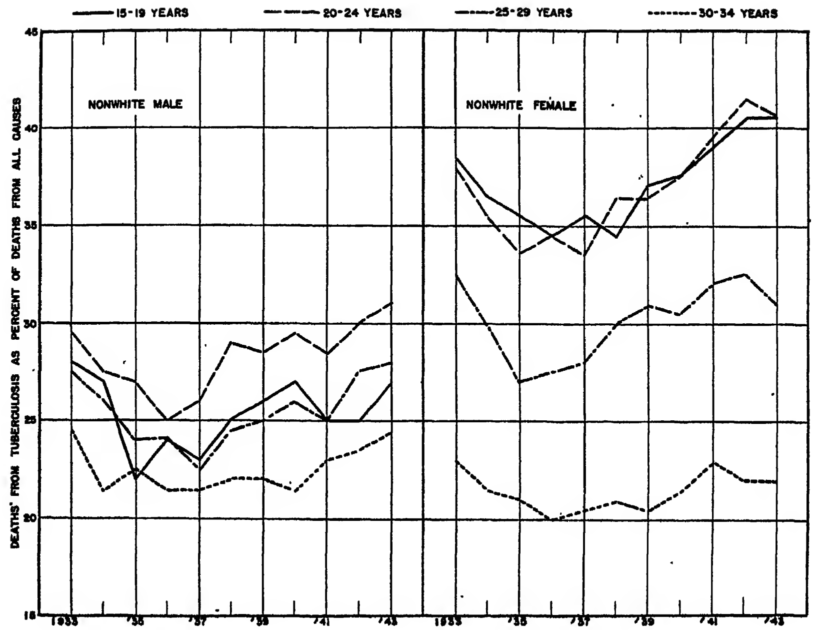

FIGURE 3.—Deaths from tuberculosis (all forms) as percentages of deaths from all causes among nonwhite males and females, aged 15-34, in 5-year age groups: United States, 1933 to 1943.

TREND OF MAJOR CAUSES OF DEATH

The reversal of the trend of tuberculosis proportionate mortality among nonwhite young adults can be more adequately evaluated if the course of tuberculosis mortality is studied in conjunction with those of the other major causes of death in these age periods. Such analysis will indicate whether or not the increase in the tuberculosis death ratios merely reflects large reductions in mortality from one or more major causes of death. In other words, if progress is being achieved at a very fast pace for one or more causes of death which are of numerical importance, tuberculosis proportionate mortality will suffer by comparison. If such decreases have occurred, it becomes necessary, for the purposes of determining the true relative trend of tuberculosis mortality, to eliminate the causes showing sharp reductions and to base the comparison on all the remaining causes. If the ratios of deaths from tuberculosis to deaths from these remaining causes are on the increase, then it can be stated that the course of tuberculosis mortality is unfavorable in the sense that it does not share to the same degree the benefits which result from general improvements in health.

In table 2 and figure 4 are shown, for nonwhite males and females aged 15–34, the number of total deaths, the number of tuberculosis deaths, and deaths from the major causes in this age group from 1933

to 1942. An inspection of the different lines affords a visual impression of the relative rates of decline of the different causes. In other words, causes of death which decline at essentially the same rate would appear as parallel lines on the chart, while one which declines

TABLE 2.—*Deaths from all causes, from tuberculosis (all forms), and from certain other numerically important causes among nonwhite males and females aged 15–34 years: United States, 1933–42*

Year	All causes	Tuberculosis (all forms)	Homicide	Accidents	Puerperal causes	Influenza and pneumonia	Diseases of the circulatory system	All other causes
				Male				
1933	19, 356	5, 279	2, 630	2, 833	----------	2, 168	1, 159	5, 287
1934	20, 016	5, 051	2, 909	3, 141	----------	2, 265	1, 251	5, 399
1935	18, 348	4, 372	2, 530	2, 830	----------	2, 483	1, 170	4, 963
1936	19, 937	4, 716	2, 406	3, 078	----------	3, 319	1, 234	5, 184
1937	18, 855	4, 361	2, 395	2, 939	----------	3, 033	1, 095	5, 032
1938	16, 622	4, 144	2, 094	2, 715	----------	1, 941	1, 115	4, 613
1939	15, 423	3, 875	2, 136	2, 498	----------	1, 422	1, 011	4, 481
1940	15, 209	3, 887	2, 173	2, 671	----------	1, 084	1, 025	4, 369
1941	14, 952	3, 764	2, 161	2, 954	----------	965	987	4, 121
1942	13, 931	3, 692	2, 055	2, 650	----------	792	990	3, 752
				Female				
1933	19, 820	6, 453	678	595	2, 143	1, 827	1, 376	6, 748
1934	19, 883	6, 034	693	694	2, 114	1, 794	1, 420	7, 134
1935	18, 309	5, 271	649	602	1, 958	1, 967	1, 282	6, 580
1936	19, 487	5, 572	742	724	2, 024	2, 344	1, 378	6, 703
1937	18, 495	5, 308	669	635	1, 888	2, 233	1, 355	6, 407
1938	17, 298	5, 223	622	574	1, 871	1, 452	1, 341	6, 215
1939	16, 084	4, 919	676	607	1, 715	1, 321	1, 154	5, 692
1940	15, 591	4, 848	612	683	1, 757	1, 135	1, 175	5, 381
1941	14, 745	4, 816	606	599	1, 624	933	1, 143	5, 024
1942	13, 547	4, 503	622	557	1, 365	740	1, 087	4, 673

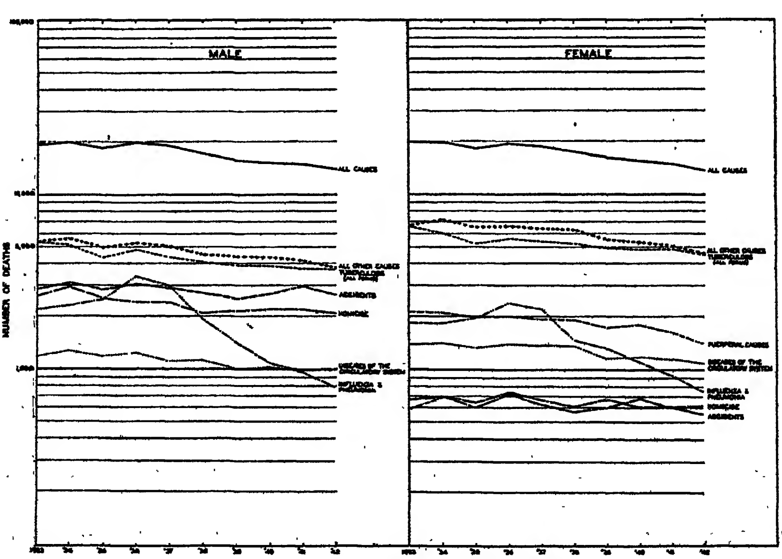

FIGURE 4.—Deaths from major causes of death, from all other causes, and from all causes among nonwhite males and females, aged 15-34 years: United States, 1933 to 1942.

at a faster rate than another will appear on the chart as moving downward at a more rapid pace. A review of the different curves in figure 4 indicates that for males there has been only one group of causes—influenza and pneumonia—which stands out as having declined since around 1937 at a very rapid rate, while all other major causes of death have shown no such marked trend. Among the curves for females, it is noted that, in addition to influenza and pneumonia, there has been a relatively sharp reduction in deaths from puerperal causes. It is, therefore, necessary to determine whether the increase in tuberculosis proportionate mortality is merely a reflection of the large decreases in deaths from influenza, pneumonia, and puerperal causes.

If the increase in tuberculosis death ratios were due entirely to the relatively great reduction in the number of influenza, pneumonia, and puerperal deaths, then the ratios of deaths from tuberculosis to all deaths other than those due to the above three causes would not show an increase. On the other hand, if the tuberculosis death ratios increase even after these deaths have been eliminated and comparison is made with the remaining causes, it is apparent that the rate of decline in tuberculosis has not been as satisfactory as might have been expected.

In table 3 is shown for nonwhite males and nonwhite females of each age group, the ratio of tuberculosis deaths to all deaths, except those due to influenza, pneumonia, and puerperal causes. Figure 5 shows the trend of these ratios for the age group 15–34 years since 1933.

It may be seen that among nonwhite males the exclusion of pneu-

TABLE 3.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes other than pneumonia, influenza, and puerperal causes for nonwhite males and females aged 15–34, in 5-year age groups: United States, 1933–42*

Year	Male					Female				
	15–19	20–24	25–29	30–34	15–34	15–19	20–24	25–29	30–34	15–34
1933	31.3	33.3	31.0	27.7	30.7	50.5	47.9	40.2	27.9	40.7
1934	29.9	31.1	29.1	24.7	28.5	47.3	44.6	36.6	26.3	37.8
1935	25.2	31.0	27.7	25.7	27.6	47.8	43.4	33.9	26.1	36.6
1936	29.5	30.3	28.7	25.9	28.4	47.2	44.8	34.9	24.7	36.9
1937	27.4	30.7	26.9	25.6	27.6	47.8	43.4	35.3	25.7	36.9
1938	28.8	32.4	27.6	25.0	28.2	45.3	45.5	36.8	25.1	37.4
1939	28.8	31.0	27.7	24.5	27.7	47.8	45.5	37.4	24.7	37.7
1940	29.2	31.4	28.1	23.0	27.5	49.2	46.2	37.5	25.3	38.2
1941	26.9	30.4	26.4	24.5	26.9	48.9	48.7	38.5	26.9	39.5
1942	26.7	31.7	29.3	25.0	28.1	49.5	49.9	38.5	25.5	39.4

monia and influenza deaths eliminates the increase in proportionate mortality. However, since 1936, the death ratios from tuberculosis remained nearly constant. In other words, from 1936 onward, tuberculosis mortality decreased at approximately the same rate as the total death rate after influenza and pneumonia have been excluded. When compared with previous years, the course of tuberculosis mortality has not been so favorable in the sense that the more accel-

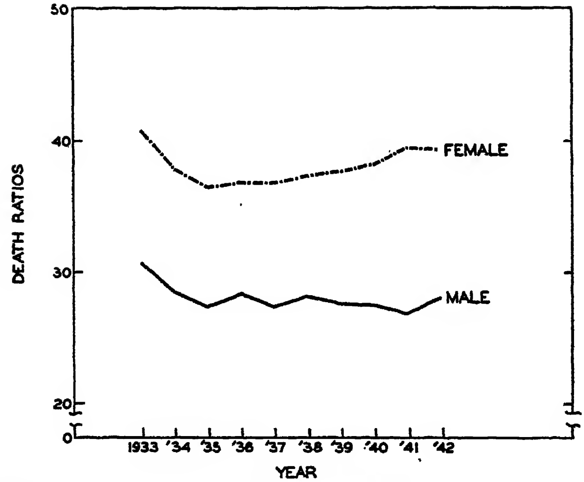

FIGURE 5.—Deaths from tuberculosis (all forms) as percentages of deaths from all causes other than influenza, pneumonia, and puerperal causes for nonwhites, aged 15-34, by sex: United States, 1933 to 1942.

erated rate of decline for tuberculosis mortality as compared with total mortality has apparently been leveling off.

Among females the exclusion of influenza, pneumonia, and puerperal deaths depresses only slightly the increase in the death ratios. The trend of the ratios is upwards even after these deaths have been excluded. The general picture is very similar to that of death ratios based on all deaths (including influenza, pneumonia, and puerperal causes): that is, the course of the tuberculosis death rate in 1934 and 1935 was more favorable than that of the total death rate; in 1936 and in 1937 the trend was essentially the same as that of the total death rate; and from 1938 on, the total death rate (excluding influenza, pneumonia, and puerperal causes) decreased faster than that for tuberculosis.

SUMMARY

Beginning with 1938, a reversal in the downward trend of tuberculosis proportionate mortality has occurred, among nonwhite young adults. By 1943 the tuberculosis death ratios had surpassed those for 1930. Part of this increase was due to sharp decreases in deaths from influenza, pneumonia, and puerperal causes. A considerable increase remained, however, among females when these causes were eliminated; and among males, the ratios of deaths from tuberculosis to deaths from all causes other than influenza and pneumonia have remained nearly constant since 1936. It is, therefore, indicated that tuberculosis mortality among nonwhite young adult males did not fare better than total mortality. Among nonwhite young adult females, tuberculosis mortality progressed in a less satisfactory manner than the aggregate of all other causes, many of which are not, with present knowledge, preventable.

NEGRO MORTALITY

I. MORTALITY FROM ALL CAUSES IN THE DEATH REGISTRATION STATES [1]

By MARY GOVER, *Statistician, United States Public Health Service*

Negro mortality from all causes tabulated and assembled by the Bureau of the Census for different sections of the United States and for specific ages will be presented in this section of a summary of current Negro mortality.

Mortality from all causes, while it furnishes no details concerning specific causes of death, serves to point out a few salient facts, and is an over-all index of the effective forces of mortality under different conditions of environment and for different races.

LIFE EXPECTANCY

The functions of a life table, including the expectation of life at any desired age, provide convenient means of summarizing conditions of mortality at a given time. It must be remembered, however, that a life-table population is stationary and therefore artificial; that is, it is a population in which there is no immigration or emigration, the number of births is a constant and the age-specific death rates from which the table is computed are those of the same chosen period for every age.

Life tables for a reasonably large proportion of the Negro population have been computed by the Bureau of the Census at 10-year intervals, based on death rates for the years 1919–21, 1929–31 and 1939–41. A comparison of the 1919–21 and 1929–31 tables, computed for the death registration States of 1920, show very unfavorable results for Negroes. Both males and females show decreases in expectation of life at practically every age; only at birth, for Negro females, did the expectation of life show an appreciable increase. In view of the later trend in Negro mortality, however, these results are apparently not dependable. Immediately following the influenza epidemic of 1918 Negro mortality was exceptionally low for several years; and it was these unusual rates which were used in the construction of the 1919–21 life tables. Low mortality rates for 1919–21 would result in a greater expectation of life at specific ages, and a consequent decrease in life expectancy when compared with 1929–31 tables which were based on more average death rates.

A comparison of expectation of life at selected ages for the periods 1929–31 and 1939–41 is shown in table 1 and figure 1 for Negro and white males and females. The bars plotted in figure 1 are the differences between the expectations of life in 1939–41 and 1929–31 as given

[1] From the Division of Public Health Methods, U. S. Public Health Service.
This is the first in a series of short reports on Negro mortality consisiting of data assembled from available sources and prepared at the request of the office of Negro Health Work, U. S. Public Health Service.

TABLE 1.—*Expectation of life at selected ages for Negro and white males and females, 1929–31 and 1939–41* [1]

Age	Negro				White			
	Male		Female		Male		Female	
	1929–31	1939–41	1929–31	1939–41	1929–31	1939–41	1929–31	1939–41
	Expectation of life (years)							
At birth	47.55	52.26	49.51	55.56	59.12	62.81	62.67	67.29
10	44.27	48.34	45.33	50.75	54.96	57.03	57.65	60.85
20	35.95	39.52	37.22	42.04	46.02	47.76	48.52	51.38
30	29.45	32.05	30.67	34.40	37.54	38.80	39.99	42.21
40	23.36	25.06	24.30	27.19	29.22	30.03	31.52	33.25
50	17.92	19.06	18.60	20.95	21.51	21.96	23.41	24.72
60	13.15	14.37	14.22	16.10	14.72	15.05	16.05	17.00
70	8.78	10.11	10.38	11.82	9.20	9.42	9.98	10.50
80	5.42	6.58	6.90	8.02	5.26	5.38	5.63	5.88

[1] From life tables prepared by the Bureau of the Census. (See references 1 and 2.)

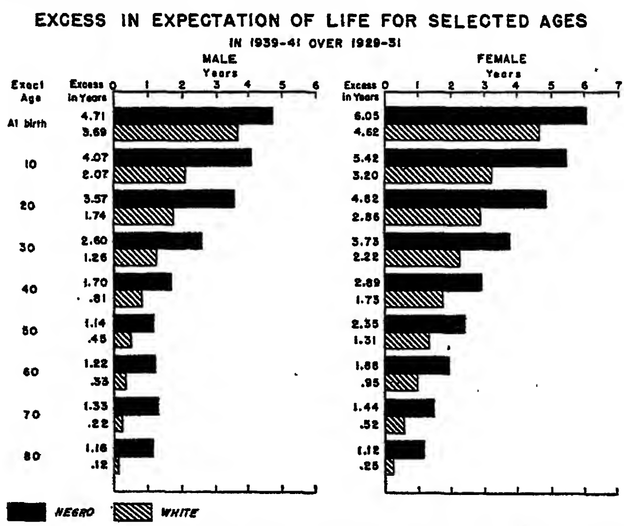

FIGURE 1.—Excess in expectation of life at selected ages in 1939–41 over 1929–31 for Negro and white males and females.

in table 1; or the excess for specific ages in 1940 over 1930. Obviously there is a greater expectation of life in 1940 for both races; the excess in 1940 over 1930 (fig. 1), however, is 1 to 2 years greater for Negro males than for white males under approximately 40 years of age and greater for Negro than white females under 60 years of age. The Negro increase in expectation of life compared with the white is relatively greater at ages over 50 years.

MORTALITY FOR GEOGRAPHIC SECTIONS

Mortality from all causes for the entire Negro population of the United States, 1939–41, is shown for specific States in table 2 and for nine geographic sections in figure 2. The rates given in column 4 of

TABLE 2.—*Negro and white mortality from all causes in separate States*

State and section	Negro population	Proportion of colored population that is Negro	Mortality from all causes		
			Crude 1939–41	Age-adjusted [1] 1940	
			Negro	Nonwhite	White
	Number	Percent	Rate per 1,000		
New England	101,509	93.9	14.2	[3] 15.3	10.1
Maine	1,304	48.6	[2] *19.7*	*9.2*	10.2
New Hampshire	414	77.4	*16.1*	*20.7*	10.0
Vermont	384	90.4	*18.2*	*10.2*	10.3
Massachusetts	55,391	93.7	14.3	14.6	10.2
Rhode Island	11,024	95.5	*16.3*	17.9	10.4
Connecticut	32,992	97.5	13.2	15.4	9.7
Middle Atlantic	1,268,366	97.4	13.9	[3] 17.3	10.7
New York	571,221	95.3	12.7	16.2	10.7
New Jersey	226,973	99.1	14.9	17.5	10.4
Pennsylvania	470,172	99.4	14.9	17.9	11.0
East North Central	1,069,326	97.4	15.0	[3] 16.9	10.0
Ohio	339,461	99.5	15.2	16.7	10.1
Indiana	121,916	99.5	15.9	16.6	10.1
Illinois	387,446	98.6	15.9	17.3	10.3
Michigan	208,345	96.2	12.7	15.8	10.0
Wisconsin	12,158	49.0	13.9	17.6	9.1
West North Central	350,992	86.6	16.6	[3] 16.5	8.8
Minnesota	9,928	42.6	15.9	15.4	8.7
Iowa	16,694	95.0	15.7	15.1	8.5
Missouri	244,386	99.6	17.0	17.3	9.6
North Dakota	201	1.9	*34.8*	*15.8*	8.4
South Dakota	474	2.0	*13.4*	*15.4*	7.9
Nebraska	14,171	77.8	14.3	14.6	8.4
Kansas	65,138	97.9	15.7	14.6	8.5
South Atlantic	4,698,863	99.4	13.8	[3] 17.4	10.5
Delaware	35,876	99.7	17.2	19.6	10.2
Maryland	301,931	99.7	16.3	19.0	11.0
District of Columbia	187,266	99.2	15.8	18.6	11.6
Virginia	661,449	99.9	15.5	18.0	10.6
West Virginia	117,754	99.9	13.9	17.4	10.2
North Carolina	981,298	97.7	11.7	15.2	10.1
South Carolina	814,164	99.8	13.3	17.8	10.8
Georgia	1,084,927	99.9	13.6	16.8	10.3
Florida	514,198	99.8	14.5	17.9	10.4
East South Central	2,780,635	99.9	13.7	[3] 16.4	10.2
Kentucky	214,031	99.9	18.2	17.8	10.2
Tennessee	508,736	99.9	15.0	16.8	10.2
Alabama	983,290	99.9	13.5	16.8	10.4
Mississippi	1,074,578	99.7	12.3	15.0	10.1
West South Central	2,425,121	97.2	12.3	[3] 14.8	9.9
Arkansas	482,578	99.8	10.6	12.6	9.1
Louisiana	849,303	99.7	13.3	16.0	10.9
Oklahoma	168,849	72.7	12.6	14.1	8.9
Texas	924,391	99.7	12.2	14.6	10.3
Mountain	36,411	21.3	16.8	[3] 17.1	10.6
Montana	1,120	5.9	*24.4*	*15.8*	10.0
Idaho	595	10.7	*20.7*	*15.1*	9.8
Wyoming	956	23.1	*23.4*	*19.3*	9.6
Colorado	12,176	72.5	19.4	16.0	10.2
New Mexico	4,672	11.8	15.4	8.5	12.0
Arizona	14,993	20.7	13.0	14.9	12.5
Utah	1,235	16.7	*20.8*	*12.6*	10.0
Nevada	664	10.7	*32.1*	*22.5*	12.4
Pacific	134,295	37.0	14.1	[3] 14.5	10.1
Washington	7,424	19.5	21.5	18.0	9.8
Oregon	2,565	18.4	18.6	17.7	9.5
California	124,306	40.0	13.6	13.6	10.2
United States	12,865,518	95.6	13.7	[3] 16.5	10.2

[1] Adjusted rates for States are taken from Vital Statistics—Special Reports, vol. 23, No. 1 (*4*). Rates are adjusted to the age distribution of the population of the United States as enumerated in 1940.
[2] Rates in italics are based on small numbers.
[3] Adjusted rates for the United States and for geographic sections are Negro.

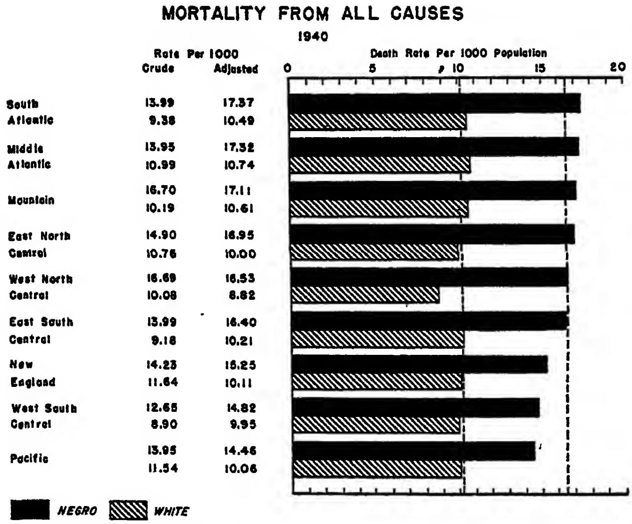

FIGURE 2.—Negro and white mortality from all causes in geographic areas of the United States, 1940. Rates are adjusted to the age distribution of the population of the United States as enumerated in 1940.

table 2 and in figure 2 are for Negroes and not the total nonwhite population as has been necessary heretofore. In the Mountain and Pacific sections the colored population is only 21 and 37 percent Negro (table 2) and therefore in no way represents the Negro race. The remainder of the colored population is largely Indian in the Mountain section (71 percent) and Japanese, Chinese, Indian, and Filipino in the Pacific (31, 12, 10, and 9 percent, respectively). In the West North Central section the colored population is only 87 percent Negro because of the Indian populations of North and South Dakota and Minnesota. In all other sections and in the country as a whole the colored population is 94 or more percent Negro and therefore can be taken to represent the Negro race.

The bars plotted in figure 2 represent rates which have been adjusted for age to the total population of the United States as enumerated in 1940; they therefore permit of a comparison among the sections after differences in age distribution have been eliminated. Age adjustment raises the Negro rate in all sections because of the standard used; the white population, which forms the major portion of the total, is older than the Negro and therefore age-adjustment weights the total rate with relatively more of the high old-age mortality. Among sections, the Middle and South Atlantic are raised the most by age-adjustment. When the Negro adjusted rates are arrayed, as in figure 2, the corresponding white rates are roughly arrayed also; that is, for both Negroes

and whites mortality is relatively high in the Middle and South Atlantic and relatively low in the East and West South Central, having reference to the sections with large numbers of Negroes. Both the New England and Pacific sections have low Negro mortality when the rates are adjusted for age. The comparatively high Negro mortality in the West North Central is probably caused by the concentration of the Negro population in large urban centers in the southern part of the section.

TREND OF AGE-SPECIFIC MORTALITY

The trend of colored and white mortality, specific for age, has been computed by the Bureau of the Census for the expanding death registration States from 1910 to 1940 and is shown in figure 3. The rates are plotted on semilogarithmic paper and give a comparison between the rapidity of the decline in colored and white rates but do not furnish a pictorial comparison of the actual heights of the rates. The expanding registration area has been used, since rates for a constant area, such as the registration States of 1920, do not materially change the picture and, moreover, exclude a large part of the colored population included in the death registration area since 1933. Prior to 1920 the trend of age-specific rates for ages 1–45 years is interrupted by the influenza epidemic of 1918.

Both colored and white mortality for all ages (fig. 3) has declined from 1910 to the present; the colored rates are, of course, higher than the white but the rate of decline has been slightly more rapid for colored rates. In 1910 the colored rates were approximately 50 percent higher than the white, while in 1940 they were only about 33⅓ percent higher.

The rate of decline in mortality has been most rapid at 1–4 years for both colored and white as shown by the slopes of the lines (fig. 3). Under 25 years of age there is no apparent difference in the rate of decline in mortality for colored and white; from 25 to 44 years the decline in the white rates is somewhat more rapid than the colored; from 45 to 64 years there is very little change in the colored rates, whereas the white declined slightly; at ages over 65 years the decline in the colored rate is somewhat greater than in the white.

On the whole the present rate of decline of Negro mortality is encouraging, particularly at ages under 25 years; in adult ages, however, 25–64 years, the rate of decline in Negro mortality has not equaled that of the white population, 1920–43 (table 3).

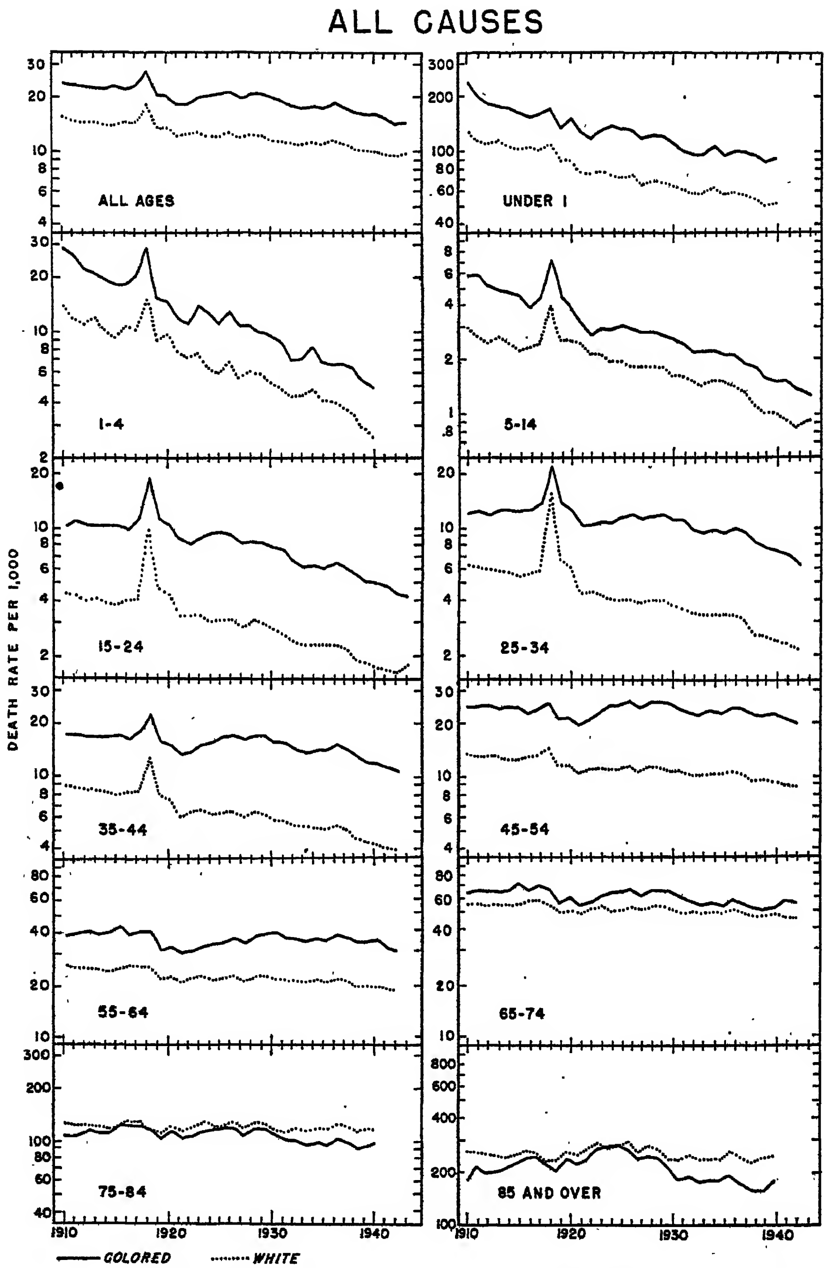

FIGURE 3.—Trend of age-specific colored and white mortality from all causes in the death registration States, 1910–43. Rates for all ages are adjusted to the age distribution of the population of the Uniten States as enumerated in 1940.

TABLE 3.—*Trend of nonwhite mortality from all causes for specific ages: death registration States, 1910–43* [1]

Year	All ages: Adjusted [2]	All ages: Crude	Under 1	1–4	5–14	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85 and over
	Death rate per 1,000												
1910	24.1	21.7	239.8	28.3	5.7	10.3	12.2	17.0	24.6	38.5	64.3	103.2	176.4
1911	23.7	21.3	197.1	25.4	5.7	11.1	12.5	17.0	24.4	39.7	65.8	104.9	209.0
1912	23.1	20.6	182.7	21.6	5.0	10.6	12.0	16.8	24.9	40.6	65.7	112.8	195.1
1913	22.7	20.3	176.3	20.2	4.7	10.5	12.5	16.8	24.2	39.5	65.0	109.9	195.4
1914	22.6	20.2	169.9	19.1	4.6	10.4	12.7	16.8	24.4	40.0	65.4	109.2	204.5
1915	23.1	20.2	161.2	17.8	4.4	10.3	12.5	17.0	24.5	42.9	70.6	120.1	219.2
1916	22.2	19.1	152.5	17.8	3.8	10.0	12.9	16.6	22.8	39.5	66.0	120.9	233.8
1917	23.4	20.4	157.7	19.7	4.3	11.2	14.0	18.1	24.0	40.9	68.9	120.0	237.1
1918	28.0	25.6	167.7	28.4	7.0	19.1	22.6	22.4	26.2	40.6	66.6	112.7	215.4
1919	20.5	17.9	133.0	15.0	4.4	11.6	14.0	15.9	21.2	32.5	56.4	102.7	197.3
1920	20.6	17.7	149.2	14.6	3.8	10.4	12.8	15.2	21.5	33.2	60.2	111.2	232.3
1921	18.2	15.5	126.6	11.8	3.1	8.9	10.6	13.5	19.7	31.0	54.3	101.7	216.5
1922	18.3	15.2	117.4	10.7	2.7	8.3	10.5	14.1	21.2	31.7	56.1	103.6	233.8
1923	19.8	16.5	129.2	13.4	2.9	8.8	11.0	15.2	23.1	33.8	59.7	110.8	263.1
1924	20.5	17.1	134.1	12.6	2.9	9.3	11.1	16.0	24.8	34.9	62.6	112.8	265.9
1925	20.9	17.4	130.6	11.0	3.0	9.5	11.8	16.8	25.5	35.5	63.8	114.9	271.1
1926	21.4	17.8	129.6	12.5	2.9	9.2	12.2	17.2	26.9	37.4	65.2	116.8	257.5
1927	19.8	16.4	116.3	10.4	2.8	8.4	11.4	16.4	24.9	35.8	60.9	105.0	230.7
1928	20.9	17.1	121.2	10.5	2.8	8.6	12.1	17.2	26.5	38.7	65.1	113.9	239.2
1929	21.0	16.9	120.6	9.7	2.7	8.4	12.2	17.2	26.4	40.3	64.9	116.2	228.9
1930	20.1	16.3	110.0	9.3	2.6	8.0	11.6	16.1	25.8	40.8	63.9	104.2	204.9
1931	19.0	15.5	101.4	8.6	2.4	7.7	11.3	15.7	24.2	38.7	59.2	99.6	178.1
1932	17.8	14.5	94.6	6.9	2.2	6.7	10.1	14.5	22.9	38.1	55.7	97.8	181.9
1933	17.2	14.1	93.5	7.0	2.2	6.2	9.7	13.9	22.5	37.1	54.4	92.4	169.7
1934	17.9	14.8	103.9	8.1	2.2	6.3	10.0	14.4	23.7	37.8	55.0	95.3	174.7
1935	17.3	14.3	92.9	6.7	2.1	6.1	9.7	14.5	23.1	37.5	52.5	92.3	174.2
1936	18.5	15.4	98.3	6.6	2.1	6.5	10.3	15.6	24.7	40.3	57.8	101.1	186.7
1937	17.8	14.9	97.1	6.6	1.9	6.2	9.7	14.8	24.3	38.6	55.4	95.0	168.4
1938	16.6	14.0	92.1	6.3	1.8	5.6	8.7	13.4	23.1	36.8	52.1	89.3	154.4
1939	16.0	13.5	86.5	5.3	1.6	5.1	8.2	12.5	22.4	36.8	50.2	90.7	152.9
1940	16.2	13.8	89.2	4.8	1.5	5.0	7.9	12.4	22.9	37.7	51.6	96.8	172.0
1941	15.5	13.2	17.9		1.5	4.8	7.5	12.1	22.1	33.9	57.2	96.2	
1942	14.5	12.5	15.4		1.4	4.4	7.0	11.5	21.1	32.9	55.1	86.0	
1943	14.8	12.8	17.6		1.3	4.2	8.7		26.0		67.1		

[1] Taken from Vital Statistics rates in the United States, 1900–40, Bureau of the Census, 1943 (*3*).
[2] Adjusted to the age distribution of the population of the United States as enumerated in 1940 (*4*).

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(*4*) United States Bureau of the Census: Age-adjusted death rates in the United States, 1900–1940, by Iwao M. Moriyama. Vital Statistics—Special Reports, vol. 23, No. 1, 1945.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

December 30, 1945–January 26, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the

section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended January 26, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended January 26 there were 1,724 cases of diphtheria reported, as compared with 1,384, 1,059, and 1,355 for the corresponding period in 1945, 1944, and 1943, respectively. The 1941–45 median was represented by the 1943 figure (1,355 cases). Each section of the country except the West North Central, Mountain, and Pacific reported more cases than occurred in those sections in 1945, while all sections except the Mountain, where the incidence was about normal, reported excesses over the preceding 5-year median. For the country as a whole the current incidence is the highest reported for this period since 1940 when 1,829 cases occurred.

Influenza.—The number of cases of influenza dropped from 319,576 during the preceding 4-week period to 116,267 during the 4 weeks ended January 26. A comparison of the current figure with preceding years shows that with the exception of the year 1944 when approximately 262,000 cases were reported during the first 4 weeks of the year the incidence was the highest since 1933; approximately 144,000 cases were reported during January of that year. The current figure was about 6 times the 1941–45 median which was represented by the 1945 figure (17,421 cases).

Reports indicate that the current rise of influenza started about the third week in November and for the country as a whole as well as in some sections the peak was reached during the week ended December 22. In the New England, East South Central, and Pacific sections, however, the largest numbers of cases were reported during the first 2 weeks of January. In a group of States [1] in which reporting of influenza cases has been reasonably consistent, the cases dropped from approximately 43,000 during the week ended December 22 to 11,679 during the week ended January 26 with each section of the country showing a rapid decline from its peak week.

While there are no data available on deaths from influenza and pneumonia, it may be assumed that at least part of the increased death rate from all causes which was reported for 93 large cities during the month of January was due to these causes. The reports released by the Bureau of the Census showed an excess of 14 percent over the average for the same period in 1942, 1943, and 1945. In January of 1944 influenza was epidemic and there were 45,595 deaths reported as compared with 44,081 for the 4 weeks ended January 26, 1946.

[1] See PUBLIC HEALTH REPORTS, Jan. 25, 1946, p. 111.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Dec. 30, 1945–Jan. 26, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period 1941–45

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,724	1,384	1,355	116,267	17,103	17,421	20,285	5,362	36,328
New England	46	37	28	986	147	147	1,087	454	2,720
Middle Atlantic	156	96	152	571	42	187	4,731	531	9,996
East North Central	292	137	168	3,264	157	571	3,906	474	3,786
West North Central	127	159	117	6,341	88	404	1,786	301	2,033
South Atlantic	373	223	250	25,930	4,723	6,163	1,498	535	2,171
East South Central	143	129	109	11,164	1,206	1,900	1,112	275	1,059
West South Central	345	342	309	54,673	9,774	9,774	1,168	687	788
Mountain	66	71	65	10,851	803	1,181	1,265	226	2,149
Pacific	176	190	154	2,487	163	738	3,732	1,879	1,881
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	907	953	953	200	147	136	10,849	18,976	14,150
New England	40	43	43	7	10	7	1,060	1,989	1,666
Middle Atlantic	192	205	205	29	34	14	2,337	3,722	3,061
East North Central	174	165	104	29	23	21	2,652	4,562	4,145
West North Central	56	79	79	13	8	9	1,060	2,100	1,557
South Atlantic	130	131	131	14	19	12	1,014	1,975	1,378
East South Central	91	98	82	12	8	10	453	954	693
West South Central	88	103	72	31	9	11	576	682	395
Mountain	25	23	23	13	14	7	526	1,131	929
Pacific	111	106	106	52	22	22	1,171	1,861	909
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	29	34	67	169	211	253	7,115	8,985	15,883
New England	0	0	0	6	7	9	1,092	1,298	1,551
Middle Atlantic	0	0	0	18	58	41	2,029	1,906	3,992
East North Central	3	7	11	24	15	34	1,268	1,529	3,647
West North Central	3	3	15	9	7	10	224	444	722
South Atlantic	1	1	3	38	39	48	951	1,302	1,672
East South Central	4	8	6	14	9	26	227	264	466
West South Central	5	6	9	35	36	43	535	949	868
Mountain	11	9	9	12	26	18	267	323	538
Pacific	2	0	4	13	14	15	522	970	1,442

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

Poliomyelitis.—The number of cases of poliomyelitis dropped from 458 during the 4 weeks ended December 29 to 200 during the current 4-week period. The number of cases was, however, slightly higher than occurred during the same weeks in 1945 and about 50 percent higher than the 1941–45 median. Five of the nine geographic sections reported a higher incidence than in 1945 and 4 reported fewer cases. All sections except the New England reported an excess over the preceding 5-year median. While the incidence of this disease was on the decline during 1945, it is significant that the number of cases reported for the first 4 weeks of 1946 was the highest reported for this period in the 18 years for which these data are available. The largest increases over the normal seasonal expectancy were reported from the Middle Atlantic, West South Central, and Pacific sections, with minor excesses in all other sections except the New England.

DISEASES BELOW MEDIAN PREVALENCE

Measles.—For the 4 weeks ended January 26 there were 20,285 cases of measles reported. The number was almost 4 times the incidence during the corresponding 4 weeks in 1945, but it was only about 55 percent of the 1941–45 median (36,328 cases). Each section of the country reported a higher incidence than in 1945, but only 4 of the 9 sections reported excesses over the preceding 5-year median. In the East North Central and East and West South Central sections the excesses were small, but in the Pacific section the number of cases was more than twice the seasonal expectancy.

Meningococcus meningitis.—The cases of this disease rose from 498 during the 4 weeks ended December 29 to 907 during the 4 weeks ended January 26, 1946. The number was, however, slightly less than the number reported during the corresponding period in 1945, which figure (945) also represents the 1941–45 median for this period. In the East North Central section the number of cases was considerably above the seasonal expectancy and some of the other sections reported minor increases, but in general the situation for the country as a whole was favorable compared with recent epidemic years; the average for this period in nonepidemic years is about 250 cases.

Scarlet fever.—The incidence of scarlet fever was also relatively low, the number of cases (10,849) reported for the current period being about 60 percent of the 1945 incidence and 75 percent of the 1941–45 median. For the country as a whole the number of cases was the lowest on record for this period. The West South Central and Pacific sections reported excesses over the preceding 5-year medians, but in all other sections the incidence was considerably below the seasonal median.

Smallpox.—For the current period there were 29 cases of smallpox reported, as compared with 34, 49, and 127 for the corresponding period in 1945, 1944, and 1943, respectively. The 1941–45 median was 67 cases. Eleven of the total cases were reported from the Mountain section and 5 from the West South Central section; the remaining cases were widely distributed over the other sections of the country.

Typhoid and paratyphoid fever.—The incidence of these diseases was also relatively low, 169 cases being reported for the current period, as compared with 211 in 1945 and a median of 253 cases for the corresponding period in 1941–45. The situation was favorable in all sections of the country. For the country as a whole the current incidence was the lowest on record for this period of the year.

Whooping cough.—The number of cases (7,115) of whooping cough reported for the 4 weeks ended January 26 was low—about 55 percent below the seasonal expectancy of approximately 16,000 cases. Each section of the country reported fewer cases than normally occur during

this period, the greatest declines from the median occurring in the Middle Atlantic and East North Central sections.

MORTALITY, ALL CAUSES

For the 4 weeks ended January 26 there were 44,081 deaths from all causes reported by 93 large cities to the Bureau of the Census. The 1943–45 average for this period was 42,033 deaths. The number of deaths was only 4.9 percent above the 3-year average for the corresponding period in 1943, 1944, and 1945 which included part of the 1943–44 influenza epidemic; however, it was 11.1 percent above the average for the same period in the years 1942, 1943, and 1945 when influenza was not epidemic during the month of January.

DEATHS DURING WEEK ENDED JAN. 26, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 26, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	10,082	9,661
Average for 3 prior years	9,947	
Total deaths, first 4 weeks of year	43,839	38,788
Deaths under 1 year of age	602	620
Average for 3 prior years	665	
Deaths under 1 year of age, first 4 weeks of year	2,417	2,516
Data from industrial insurance companies:		
Policies in force	67,139,531	66,965,045
Number of death claims	17,260	14,562
Death claims per 1,000 policies in force, annual rate	13.4	11.3
Death claims per 1,000 policies, first 4 weeks of year, annual rate	11.7	10.3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 2, 1946

Summary

The reported incidence of influenza declined only slightly during the current week. A total of 14,255 cases was reported, as compared with 14,481 for the preceding week. A correspondingly slight decline was recorded in total deaths in 93 large cities in the United States—from 10,157 to 10,068. The areas which have been the most severely affected are the South Atlantic, South Central, East North Central, and Mountain States.

Currently the largest increase was reported in West Virginia (from 67 to 749). Other States reporting more than 500 cases during the current week are as follows (last week's figures in parentheses): Virginia 1,307 (1,465); South Carolina 1,767 (1,567); Alabama 727 (757); Louisiana 1,317 (1,202); Utah 999 (1,179); and Texas 4,652 (5,035).

The incidence of diphtheria, measles, and poliomyelitis is above that for last year, while meningitis, scarlet fever, smallpox, typhoid fever, and whooping cough are below last year's figures. To date, 2,116 cases of diphtheria have been reported, as compared with 1,723 for the same period last year, and 248 cases of poliomyelitis as compared with 194 last year.

During the current week 1 case of anthrax was reported in South Dakota; of 6 cases of smallpox, 4 occurred in Texas, and of 36 cases of typhoid and paratyphoid fever, 10 occurred in the South Atlantic States and 6 in California.

A total of 10,068 deaths was recorded in 93 large cities in the United States, as compared with 10,157 last week, 10,069 for the same week last year and a 3-year (1943–45) average of 9,948. The total to date in these cities is 54,224, as compared with 49,157 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended Feb. 2, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945	
NEW ENGLAND												
Maine	0	1	0	------	------	2	29	5	69	0	0	0
New Hampshire	0	0	0	3	------	------	15	------	------	0	0	0
Vermont	0	0	0	32	2	2	3	4	12	0	0	0
Massachusetts	3	3	3	------	------	------	203	54	438	6	2	4
Rhode Island	0	0	0	------	------	1	------	18	20	0	0	0
Connecticut	2	1	1	15	------	8	60	78	155	2	7	1
MIDDLE ATLANTIC												
New York	21	22	13	[1] 12	[1] 5	[1] 12	745	107	1,205	17	25	25
New Jersey	6	0	2	19	5	23	156	26	726	6	7	7
Pennsylvania	19	13	10	4	1	1	1,047	62	1,757	19	18	16
E. NORTH CENTRAL												
Ohio	33	12	12	40	1	14	69	20	180	9	11	11
Indiana	23	12	12	103	21	35	140	16	105	4	1	1
Illinois	6	7	17	8	3	29	668	58	371	13	24	8
Michigan [2]	12	6	8	11	1	21	787	20	166	10	5	5
Wisconsin	2	0	0	214	16	84	63	28	554	3	3	3
W. NORTH CENTRAL												
Minnesota	22	5	5	2	------	2	12	5	21	7	1	1
Iowa	1	3	4	------	------	7	32	29	103	2	2	1
Missouri	6	9	8	8	10	10	230	8	141	5	11	11
North Dakota	2	3	3	21	------	28	------	1	13	0	0	0
South Dakota	2	0	0	------	------	2	100	10	31	3	0	0
Nebraska	1	1	1	1	6	6	36	11	25	0	1	2
Kansas	6	4	6	35	2	14	399	25	258	1	0	0
SOUTH ATLANTIC												
Delaware	1	0	0	------	------	------	12	7	13	1	0	0
Maryland [2]	15	6	4	20	4	40	73	41	41	6	0	5
District of Columbia	0	0	1	3	------	2	11	5	18	1	3	2
Virginia	13	17	12	1,307	556	660	215	49	201	5	7	7
West Virginia	5	5	5	749	92	92	61	21	125	4	1	2
North Carolina	13	6	12	------	------	78	96	22	152	15	7	7
South Carolina	5	7	6	1,767	637	871	65	7	114	0	5	9
Georgia	3	2	2	98	65	133	37	23	93	0	2	3
Florida	8	6	6	8	2	14	32	28	28	3	3	3
E. SOUTH CENTRAL												
Kentucky	9	8	6	213	2	10	329	10	115	7	9	3
Tennessee	15	2	5	178	61	127	126	30	112	9	6	4
Alabama	6	10	10	727	160	482	36	8	68	5	7	4
Mississippi [2]	2	8	3	------	------	------	------	------	------	7	2	4
W. SOUTH CENTRAL												
Arkansas	7	9	8	438	122	426	37	10	120	2	6	3
Louisiana	3	3	8	1,317	7	24	4	13	21	4	3	2
Oklahoma	7	6	6	280	117	231	49	5	20	1	1	1
Texas	43	70	42	4,652	2,259	2,259	347	137	218	10	13	13
MOUNTAIN												
Montana	1	0	4	147	11	31	15	4	163	0	0	0
Idaho	1	4	1	54	2	2	132	------	8	0	0	0
Wyoming	4	1	0	------	19	54	4	2	38	0	0	1
Colorado	6	5	6	126	14	93	100	14	220	0	3	0
New Mexico	1	9	2	1	1	3	5	------	8	1	0	0
Arizona	5	3	3	170	80	232	8	2	85	0	1	1
Utah [2]	0	0	0	999	5	6	95	35	28	0	1	1
Nevada	0	0	0	------	------	1	7	------	3	0	0	0
PACIFIC												
Washington	10	5	2	------	3	5	308	58	81	3	5	5
Oregon	5	5	1	70	12	32	58	32	120	3	4	2
California	37	40	20	403	30	175	941	426	426	17	12	12
Total	392	339	310	14,255	4,334	5,667	7,997	1,574	14,031	211	219	219
5 weeks	2,116	1,723	1,640	130,522	21,437	22,592	28,282	6,936	50,679	1,118	1,172	1,172

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Feb. 2, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945		Feb. 2, 1946	Feb. 3, 1945	
NEW ENGLAND												
Maine	0	0	0	38	85	19	0	0	0	0	1	0
New Hampshire	0	0	0	12	1	10	0	0	0	0	0	0
Vermont	0	0	0	12	7	7	0	0	0	0	0	0
Massachusetts	0	0	0	189	372	372	0	0	0	1	1	1
Rhode Island	0	0	0	14	42	16	0	0	0	0	0	0
Connecticut	0	1	1	33	88	85	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	2	12	1	375	508	445	0	0	0	3	3	6
New Jersey	0	2	0	129	167	148	0	0	0	1	1	1
Pennsylvania	0	1	1	296	350	309	0	0	0	1	23	4
EAST NORTH CENTRAL												
Ohio	2	0	0	329	282	282	0	0	0	2	3	2
Indiana	0	0	0	114	168	158	0	2	2	0	0	0
Illinois	2	1	1	145	414	327	1	0	1	1	1	2
Michigan [2]	0	0	1	133	262	224	0	3	0	2	0	2
Wisconsin	0	0	0	148	183	183	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	1	1	49	92	92	0	0	0	0	0	0
Iowa	1	0	0	41	86	75	0	0	0	0	0	1
Missouri	1	4	1	92	159	110	0	0	0	1	2	1
North Dakota	0	1	0	11	34	30	0	1	0	0	0	0
South Dakota	0	0	0	23	13	20	0	1	0	0	0	0
Nebraska	0	0	0	45	97	34	0	1	1	1	0	0
Kansas	1	0	0	65	138	90	0	0	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	5	6	9	0	0	0	0	0	0
Maryland [2]	0	0	0	59	149	90	0	0	0	1	0	1
District of Columbia	0	0	0	14	85	21	0	0	0	0	1	0
Virginia	0	1	0	94	103	50	0	0	0	0	1	1
West Virginia	0	1	1	24	63	54	0	0	0	0	0	0
North Carolina	2	1	1	65	117	63	0	0	0	3	3	0
South Carolina	0	0	0	17	9	9	0	0	0	2	0	1
Georgia	0	1	1	8	25	25	0	0	0	4	4	3
Florida	7	4	2	10	14	13	0	0	0	0	0	2
EAST SOUTH CENTRAL												
Kentucky	0	0	1	38	97	84	0	0	1	1	0	0
Tennessee	1	0	0	29	53	53	0	0	0	0	1	1
Alabama	0	0	0	13	15	15	0	0	1	0	3	1
Mississippi [2]	1	1	1	22	63	12	0	0	0	1	5	3
WEST SOUTH CENTRAL												
Arkansas	1	0	0	5	60	9	0	2	0	0	0	2
Louisiana	2	0	0	17	14	10	0	0	0	0	3	3
Oklahoma	0	2	0	28	18	18	0	0	0	0	0	1
Texas	2	2	2	86	152	76	4	0	2	1	7	3
MOUNTAIN												
Montana	3	0	0	7	11	35	1	0	0	0	0	0
Idaho	0	1	0	6	70	18	0	0	0	0	0	0
Wyoming	0	0	0	2	14	14	0	0	0	0	1	0
Colorado	0	0	0	26	102	53	0	0	0	0	0	0
New Mexico	0	1	0	15	29	5	0	0	0	2	3	1
Arizona	0	0	0	12	20	12	0	0	0	0	0	0
Utah [2]	0	0	0	50	66	66	0	0	0	0	0	0
Nevada	0	0	0	0	0	2	0	0	0	0	0	0
PACIFIC												
Washington	4	3	0	19	92	32	0	0	0	1	4	0
Oregon	0	1	0	21	32	17	0	0	0	0	1	1
California	6	5	3	231	400	189	0	0	0	6	5	5
Total	38	47	28	3,216	5,427	4,037	6	10	17	36	77	83
5 weeks	248	194	160	14,155	24,403	18,187	35	44	84	205	285	384

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Massachusetts 1; New York 1; South Carolina 1; North Carolina 1; Georgia 4; California 6.

Telegraphic morbidity reports from State health officers for the week ended Feb. 2 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Feb. 2, 1946	Whooping cough: Week ended— Feb. 3, 1945	Whooping cough: Median 1941–45	Week ended Feb. 2, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	18	28	28	---	---	---	---	---	---	---	---
New Hampshire	2	---	4	---	---	---	---	---	---	---	---
Vermont	15	64	29	---	---	---	---	---	---	---	---
Massachusetts	98	150	186	---	---	---	---	---	---	---	---
Rhode Island	19	24	24	---	---	---	---	---	---	---	1
Connecticut	43	53	59	---	---	---	---	---	---	---	4
MIDDLE ATLANTIC											
New York	256	226	315	3	12	---	1	---	---	---	6
New Jersey	133	90	132	---	---	1	2	---	---	---	2
Pennsylvania	153	219	243	---	---	---	---	---	---	1	---
EAST NORTH CENTRAL											
Ohio	124	139	248	---	---	---	---	---	---	---	4
Indiana	16	14	29	---	---	---	1	---	2	---	1
Illinois	65	75	125	2	1	---	---	---	2	---	6
Michigan [3]	102	69	216	---	8	---	---	---	1	---	---
Wisconsin	67	111	134	---	---	---	---	---	---	---	5
WEST NORTH CENTRAL											
Minnesota	9	27	56	---	---	---	---	---	---	---	---
Iowa	4	11	30	1	---	---	---	---	---	---	---
Missouri	7	28	28	---	---	---	---	---	---	---	2
North Dakota	---	2	8	---	---	---	---	---	---	---	---
South Dakota	1	1	7	---	---	---	---	---	---	---	1
Nebraska	5	6	6	---	---	---	---	---	---	---	---
Kansas	31	47	47	---	---	---	---	---	1	---	8
SOUTH ATLANTIC											
Delaware	7	1	3	---	---	---	---	---	---	---	---
Maryland [3]	25	43	47	---	---	4	1	---	---	---	---
District of Columbia	2	1	8	---	---	---	---	---	---	---	---
Virginia	52	52	105	1	---	23	---	---	2	---	1
West Virginia	12	25	55	---	---	---	---	---	---	---	---
North Carolina	35	122	177	3	---	---	---	---	1	---	---
South Carolina	51	57	70	1	16	---	---	---	---	3	---
Georgia	10	14	18	---	---	---	---	---	3	8	---
Florida	13	19	15	---	---	16	---	---	---	7	3
EAST SOUTH CENTRAL											
Kentucky	24	19	71	---	---	---	---	1	---	---	---
Tennessee	29	22	41	---	---	2	4	---	3	---	---
Alabama	19	25	25	---	---	---	---	---	---	6	2
Mississippi [3]	---	---	---	---	---	---	---	---	---	3	---
WEST SOUTH CENTRAL											
Arkansas	12	21	19	5	---	---	---	---	---	---	---
Louisiana	1	7	5	1	---	---	---	---	2	3	---
Oklahoma	27	10	10	1	1	---	---	---	---	---	2
Texas	141	188	188	14	288	105	---	---	---	18	18
MOUNTAIN											
Montana	6	9	21	---	---	---	---	---	---	---	---
Idaho	11	---	9	---	---	---	1	---	---	---	---
Wyoming	---	4	2	---	---	---	---	---	---	---	---
Colorado	24	43	43	---	---	---	---	---	---	---	---
New Mexico	25	16	19	---	---	---	---	---	---	---	---
Arizona	13	27	26	---	---	16	---	---	---	---	2
Utah [3]	29	23	23	---	---	---	---	---	---	---	2
Nevada	---	---	2	---	---	---	---	---	---	---	---
PACIFIC											
Washington	34	20	73	---	---	---	---	---	---	---	1
Oregon	12	12	12	---	---	---	---	---	---	---	1
California	115	239	250	3	---	---	---	---	1	1	3
Total	1,897	2,403	3,856	35	326	167	10	1	18	50	75
Same week, 1945	2,403	---	---	23	609	88	7	0	21	51	86
Average, 1943–45	2,771	---	---	19	310	57	10	[4] 0	17	[4] 49	80
5 weeks: 1946	9,233	---	---	198	1,748	692	41	1	122	296	329
1945	11,388	---	---	138	3,375	824	30	1	154	343	354
Average, 1943–45	13,417	---	[4] 19,739	115	1,761	424	41	[4] 1	109	[4] 263	153

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

Anthrax: South Dakota i case;

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 26, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	-------	0	1	0	12	0	0	8
New Hampshire:												
Concord	0	0	------	0	-------	0	0	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	-------	0	0	0	3	0	0	------
Massachusetts:												
Boston	0	0	------	2	15	0	13	0	41	0	0	9
Fall River	0	0	------	0	-------	0	2	0	4	0	0	5
Springfield	0	0	------	0	-------	0	0	0	6	0	0	2
Worcester	0	0	------	0	6	0	10	0	11	0	0	3
Rhode Island:												
Providence	0	0	2	0	-------	1	4	0	9	0	0	69
Connecticut:												
Bridgeport	0	0	4	1	2	0	1	0	2	0	0	1
Hartford	0	0	------	0	1	0	1	0	4	0	0	19
New Haven	0	0	1	1	1	0	4	0	4	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	1	15	0	5	0	9	0	0	33
New York	11	2	28	1	190	15	86	2	177	0	0	35
Rochester	0	0	------	0	35	0	1	0	17	0	0	2
Syracuse	0	0	------	0	551	0	4	0	11	0	0	4
New Jersey:												
Camden	2	0	2	0	1	0	4	0	2	0	0	1
Newark	0	0	4	0	14	2	6	0	8	0	0	17
Trenton	0	0	4	0	1	0	5	0	0	0	0	------
Pennsylvania:												
Philadelphia	1	0	15	2	298	6	34	0	37	0	1	40
Pittsburgh	1	0	------	0	-------	0	4	0	5	0	0	------
Reading	0	0	1	0	1	0	6	0	1	0	0	11
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	4	0	4	3	11	0	15	0	0	9
Cleveland	0	0	7	1	4	1	10	0	26	0	0	15
Columbus	9	0	2	2	2	0	1	0	7	0	0	1
Indiana:												
Fort Wayne	0	0	------	0	1	0	1	0	1	0	0	3
Indianapolis	5	0	------	3	19	0	3	0	14	0	0	17
South Bend	0	0	------	0	-------	1	0	0	3	0	0	------
Terre Haute	1	0	------	0	-------	0	1	0	1	0	0	------
Illinois:												
Chicago	0	0	9	1	467	10	45	1	46	0	0	47
Springfield	0	0	------	0	1	0	2	0	5	0	0	------
Michigan:												
Detroit	3	1	6	0	266	8	14	0	29	0	0	36
Flint	1	0	------	0	29	1	3	0	3	0	0	------
Grand Rapids	0	0	------	0	8	1	2	0	0	0	0	2
Wisconsin:												
Kenosha	0	0	------	0	1	0	0	0	5	0	0	------
Milwaukee	0	0	------	0	44	2	3	0	33	0	0	11
Racine	0	0	------	0	-------	0	0	0	5	0	0	3
Superior	0	0	------	0	1	0	0	0	1	0	0	4
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	-------	0	2	0	0	0	0	------
Minneapolis	1	0	------	0	1	0	6	0	14	0	1	1
St. Paul	1	0	------	0	-------	0	1	0	12	0	0	3
Missouri:												
Kansas City	1	0	5	4	94	1	6	0	10	0	0	16
St. Joseph	0	1	------	0	48	0	0	0	0	0	0	1
St. Louis	5	0	6	3	19	1	15	1	18	0	0	9

City reports for week ended Jan. 26, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0		0	3	1	7	0	12	0	0	
Kansas:												
Topeka	1	0		0	30	0	1	0	5	0	0	
Wichita	0	0	1	0	20	0	7	0	2	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0		0	2	1	1	0	1	0	0	1
Maryland:												
Baltimore	17	0	6	2	24	1	9	0	20	0	0	25
Cumberland	0	0		0		0	0	0	1	0	0	
Frederick	0	0		0		0	0	0	0	0	0	
District of Columbia:												
Washington	0	0	5	2	8	2	7	0	12	0	2	5
Virginia:												
Lynchburg	0	0		0		1	1	0	1	0	0	3
Richmond	0	0	1	1	7	1	5	1	11	0	0	
Roanoke	1	0		0	1	0	0	0	3	0	0	
West Virginia:												
Wheeling	0	0		0	2	0	0	0	3	0	0	6
North Carolina:												
Raleigh	0	0		0	3	0	2	0	2	0	0	
Wilmington	0	0		0		0	3	0	3	0	0	8
Winston-Salem	0	0		0		0	1	0	4	0	0	6
South Carolina:												
Charleston	2	0	45	0		0	1	0	1	0	0	
Georgia:												
Atlanta	1	0	39	1		0	5	0	3	0	0	
Brunswick	0	0		0		0	1	0	0	0	0	
Savannah	0	0	18	1		0	3	0	0	0	0	
Florida:												
Tampa	1	0		0	8	0	2	0	0	0	0	4
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	25	1	11	1	11	0	9	0	0	4
Nashville	0	0		4	19	1	3	0	0	0	0	
Alabama:												
Birmingham	0	0	24	0		2	6	0	3	0	0	
Mobile	0	0	13	1		0	0	0	0	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0		0	4	2	0	0	0	0	0	
Louisiana:												
New Orleans	[1]27	0	8	4		[1]6	14	3	8	0	1	
Shreveport	1	0		0		0	7	0	3	0	0	
Texas:												
Dallas	2	0	4	4		0	4	0	11	0	0	
Galveston	3	0		0		0	1	0	2	0	0	
Houston	3	0	1	1		0	12	0	2	0	2	
MOUNTAIN												
Montana:												
Billings	0	0		0		0	1	0	0	0	0	
Great Falls	0	0		0		0	2	0	0	0	0	
Helena	0	0		0		0	0	0	1	0	0	
Missoula	0	0		0		0	1	0	0	0	0	
Idaho:												
Boise	0	0		0	2	0	0	0	0	0	0	
Colorado:												
Denver	0	0	9	2	23	0	11	0	13	0	0	19
Pueblo	2	0		0		0	3	0	3	0	0	1
Utah:												
Salt Lake City	0	0		0	14	0	4	0	6	0	0	2

City reports for week ended Jan. 26, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza: Cases	Influenza: Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	5	0	------	0	100	0	2	0	6	0	0	7
Spokane	0	0	------	0	31	1	0	0	2	0	0	3
Tacoma	0	0	------	0	24	0	0	0	6	0	0	2
California:												
Los Angeles	3	0	32	3	76	5	5	3	65	0	1	9
Sacramento	1	0	1	1	15	0	8	0	0	0	0	5
San Francisco	3	0	20	0	98	1	9	0	18	1	0	1
Total	116	4	357	50	2,665	79	462	115	854	1	8	549
Corresponding week, 1946	69	------	89	38	351	------	464	------	1,612	0	18	551
Average, 1941–45	68	------	1,550	[1] 77	[2] 2,965	------	[1] 555	------	1,360	2	14	906

[1] Including reports from Charity Hospital.
[2] 3-year average, 1943–45.
[3] 5-year median, 1941–45.

Dysentery, amebic.—Cases: Hartford, 1; New York, 2; Baltimore, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: New York, 1; Detroit, 1; Charleston, S. C., 1; Los Angeles, 4.
Dysentery, unspecified.—Cases: Mobile, 1.
Tularemia.—Cases: St. Louis, 2; Nashville, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: Atlanta, 2; Savannah, 1; New Orleans, 4 (including reports from Charity Hospital.)

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,016,500)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza: Case rates	Influenza: Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	0.0	0.0	18.3	10.5	65	2.6	94.1	0.0	254	0.0	0.0	303
Middle Atlantic	6.9	0.9	25.0	1.9	512	10.6	71.7	0.9	124	0.0	0.5	66
East North Central	11.6	0.6	17.0	4.3	515	16.4	58.4	0.6	118	0.0	0.0	90
West North Central	18.1	2.0	24.1	14.1	432	6.0	90.5	2.0	147	0.0	2.0	62
South Atlantic	36.8	0.0	190.9	11.7	92	10.0	68.7	1.7	109	0.0	3.3	97
East South Central	5.9	0.0	395.4	35.4	177	23.6	118.0	0.0	71	0.0	0.0	24
West South Central	121.5	0.0	43.9	30.4	14	27.0	94.5	10.1	88	0.0	10.1	0
Mountain	15.9	0.0	71.5	15.9	310	0.0	174.7	0.0	183	0.0	0.0	175
Pacific	19.0	0.0	83.8	6.3	544	11.1	30.0	4.7	153	1.6	1.6	43
Total	17.8	0.6	54.9	7.7	410	12.1	71.0	1.7	131	0.2	1.2	84

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—A rat found on December 24, 1945, in Kukuihaele area, Honokaa, Hamakua District, Island of Hawaii, T. H., was proved positive for plague on December 30, 1945.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 5, 1946.—During the week ended January 5, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		6		64	353	18	38	59	116	654
Diphtheria		9	1	33	7	2			4	56
German measles				1	24		1	3	5	34
Influenza		39			93		10		30	172
Measles		8	2	151	1,463		5	11	134	1,774
Meningitis, meningococcus				1	3					4
Mumps			2	18	164	5	8	34	45	276
Poliomyelitis					1	1				2
Scarlet fever		19	10	61	85	2		18	11	206
Tuberculosis (all forms)		12	21	66	39		1	4	13	156
Typhoid and paratyphoid fever		1		1	2			1		5
Undulant fever				2					2	4
Venereal diseases:										
Gonorrhea		14	15	48	93	37	31	41	59	338
Syphilis		5	2	82	58	13	4	6	35	205
Whooping cough				41	56	8		8		113

CUBA

Habana—Communicable diseases—4 weeks ended January 5, 1946.—During the 4 weeks ended January 5, 1946, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chickenpox	1		Tuberculosis	2	
Diphtheria	14		Typhoid fever	15	
Malaria	8				

FINLAND

Notifiable diseases—November 1945.—During the month of November 1945, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	15	Ophthalmia neonatorum	11
Chickenpox	1,294	Paratyphoid fever	522
Conjunctivitis	22	Pneumonia (all forms)	1,693
Diphtheria	1,758	Poliomyelitis	48
Dysentery, unspecified	22	Puerperal fever	63
Gastroenteritis	3,002	Rheumatic fever	398
Gonorrhea	1,775	Scabies	5,335
Hepatitis, epidemic	1,059	Scarlet fever	353
Influenza	696	Syphilis	635
Laryngitis	44	Typhoid fever	89
Lymphogranuloma inguinale	1	Undulant fever	1
Malaria	7	Vincent's angina	41
Measles	67	Whooping cough	1,225
Mumps	501		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; P, present]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-November 1945	December 1945	January 1946—week ended—			
				5	12	19	26
ASIA							
Burma: Rangoon	C		[1] 65				[2] 1
Ceylon: Trincomalee District	C	16	3				
China: [3]							
Hupeh Province	C	60					
Kwangsi Province	C	12					
Kwangtung Province	C	105					
Kweichow Province	C	640					
Shensi Province	C	10					
Sikong Province	C	9					
Szechwan Province	C	13,360					
Chungking	C	8,000					
Yunnan Province	C	23					
India	C	216,472					
Bombay	C	99	2				
Calcutta	C	5,191	107				
Cawnpore	C	202					
Chittagong	C	19					
Delhi	C	318					
Madras	C	53					
Vizagapatam	C	31					
Indochina: Cochinchina	C	P					

[1] For the period May 1 to Dec. 31, 1945.
[2] For the period Jan. 1-25, 1946.
[3] Cholera was also reported present during August in the following Provinces of China: Chekiang, Honan, Hunan, and Kansu.

PLAGUE

[C indicates cases; D, deaths]

Place		January-November 1945	December 1945	January 1946—week ended 5	12	19	26
AFRICA							
Algeria	C	[1] 13	1				
Basutoland	C	4					
Bechuanaland	C	7					
Belgian Congo	C	[2] 28		1			1
British East Africa:							
Kenya	C	93			4		
Uganda	C	6			5		1
Egypt	C	221	4				
Alexandria	C					1	
Ismailiya	C	83					
Port Said	C	83	1				
Suez	C	28	3	1			
French West Africa	C	5					
Dakar	C	1					
Madagascar	C	149	23				
Morocco (French)	C	811					
Senegal	C	54					
Tunisia	C	3					
Union of South Africa	C	[3] 11	7				
ASIA							
Burma: Rangoon	C		[4] 21				[4] 2
China:							
Foochow	C	30					
Kwangtung Province	C	17					
Kiangsi Province	C	1					
Yunnan Province [5]	C	38					
India	C	24,362					
Iraq	C	34					
Palestine	C	46	6	2	2		
Plague-infected rats		42					

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place	January–November 1945	December 1945	January 1946—week ended— 5	12	19	26
EUROPE						
France: Corsica—Ajaccio ... C	8					
Great Britain: Malta ... C	[1] 72	3				
Italy ... C	27	1				
Portugal: Azores ... C	53					
Spain: Canary Islands ... C	1					
NORTH AMERICA						
Canada: Alberta Province: [7]						
Plague-infected squirrels	2					
SOUTH AMERICA						
Argentina:						
Buenos Aires Province—Plague-infected rats	2					
Santiago del Estero Province ... C	2					
Tucuman Province ... C	1					
Bolivia: Santa Cruz Department ... C	[8] 79					
Brazil:						
Ceara State ... C	5					
Pernambuco State ... C	58					
Ecuador:						
Canar Province ... C	10					
Chimborazo Province ... C	6					
Loja Province ... C	20					
Peru:						
Ancash Department ... C	7					
Ica Department ... C	[3] 4					
Lambayeque Department ... C	13					
Libertad Department ... C	11					
Lima Department ... C	15					
Otuzco Department ... C	3					
Piura Department ... C	5					
Tumbes Province ... C	19	13				
OCEANIA						
Hawaii Territory ... D	[9] 1					
Plague-infected rats [10]	13	1				
New Caledonia: Loyalty Islands—Mare Island ... C	[11] 60					

[1] Includes 4 suspected cases.
[2] Includes 7 suspected cases.
[3] Includes 1 suspected case.
[4] For the period May 1–Dec. 31, 1945.
[5] For the period Jan. 1–25, 1946.
[6] Information dated July 5, 1945, stated that from April 1944 to May 1945, 85 deaths from plague had occurred in the mountainous region south of Kunming, China.
[7] During the month of June 1945, plague infection in fleas was reported in Alberta Province. For the week ended July 28, 1945, plague infection was also reported in 6 pools of fleas in Alberta Province. For the week ended Aug. 11, 1945, 2 pools of plague-infected fleas were reported in Alberta Province, Canada.
[8] Includes 6 suspected cases.
[9] Previously reported as a case, death occurring on June 2, 1945.
[10] Plague infection was also proved positive in a pool of 5 mice on Jan. 4, in a pool of fleas on Feb. 14, and in a pool of 40 fleas on Mar. 14, 1945.
[11] Pneumonic plague.

SMALLPOX

[C indicates cases; P, present]

Place	January–November 1945	December 1945	January 1946—week ended— 5	12	19	26
AFRICA						
Algeria ... C	209					
Angola ... C	243					
Basutoland ... C	360					
Belgian Congo ... C	[1] 6,675	[1] 263	[1] 69			
British East Africa:						
Kenya ... C	784	31	15			
Nyasaland ... C	158	12	3		9	
Tanganyika ... C	5,724					
Uganda ... C	1,171	94				

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C, indicates cases; P, present]

Place		January-November 1945	December 1945	January 1946—week ended—			
				5	12	19	26
AFRICA—continued							
Cameroon (French)	C	827	10				
Dahomey	C	292	38				
Egypt	C	1,075	17		2		
French Equatorial Africa	C	1,697	18				
French Guinea	C	1,654	70				
French West Africa: Dakar District	C	401					
Gambia	C	82					
Gold Coast	C	678	166				19
Ivory Coast	C	549	14				
Libya	C	18	7	1	5		
Mauritania	C	83	2				
Morocco (French)	C	2,242	431				
Mozambique	C	1					
Nigeria	C	4,436					
Niger Territory	C	598	40				
Rhodesia:							
Northern	C	5,774					
Southern	C	16					
Senegal	C	499	5				
Sierra Leone	C	105	1				
Somaliland, British	C	1					
Sudan (Anglo-Egyptian)	C	[2] 3	1				
Sudan (French)	C	2,532	472				
Togo (British)	C	54					
Togo (French)	C	525	3				
Tunisia	C	140	67				
Union of South Africa [3]	C	2,099	P				
ASIA							
Arabia	C	29					
Burma: Rangoon	C		[4] 81				[5] 74
Ceylon	C	[6] 728	120		43		
China	C	1,272					
India	C	227,266					
Iran	C	400					
Iraq	C	41				1	
Syria and Lebanon	C	13	1				
Trans-Jordan	C	2					
Turkey (see Turkey in Europe).							
EUROPE							
Belgium	C	1					
France	C	27			2		
Germany	C	3					
Great Britain:							
England	C	5					
Scotland	C	[2] 2					
Italy	C	2,666					
Sicily	C	9					
Portugal	C	29					
Spain	C	31					
Canary Islands	C	1					
Turkey	C	295	2	1			
NORTH AMERICA							
Canada	C	6					
Guatemala	C	4					
Honduras	C	8					
Mexico	C	1,426					
Nicaragua	C	[1] 141					

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; P, present]

Place		January-November 1945	December 1945	January 1946—week ended— 5	12	19	26
SOUTH AMERICA							
Argentina	C	6					
Bolivia	C	1,646					
Brazil	C	[1] 726					
Colombia	C	1,013					
Ecuador	C	40					
Paraguay	C	1					
Peru	C	213					
Uruguay	C	100					
Venezuela	C	[1] 916	[1] 54				[1] 62

[1] Includes cases of alastrim.
[2] Imported.
[3] For the week ended June 30, 1945, cases of virulent smallpox were reported in the Union of South Africa.
[4] For the period May 1 to Dec. 31, 1945.
[5] For the period Jan. 1–25, 1946.
[6] Includes some cases of chickenpox.

TYPHUS FEVER*

[C indicates cases; P, present]

Place		January-November 1945	December 1945	January 1946—week ended— 5	12	19	26
AFRICA							
Algeria	C	1,024					
Basutoland	C	118					
Belgian Congo [1]	C	639	452	90			
British East Africa: Kenya	C	39					
Egypt	C	15,525	221				
Eritrea	C	47	34		3		
French West Africa: Dakar [1]	C	20					
Gold Coast	C	1					
Libya: Tripolitania	C	23	20	2	3		
Madagascar	C	1					
Morocco (French)	C	7,815	328				
Morocco (Spanish)	C	8					
Nigeria	C	89					
Rhodesia, Northern	C	31					
Sierra Leone [1]	C	11					
Tunisia	C	390	13				
Union of South Africa	C	866	P				
ASIA							
China	C	1,874					
India	C	23					
Iran	C	826					
Iraq [1]	C	266	7	2	2	1	
Palestine [1]	C	166					
Syria and Lebanon	C	13	2				
Trans-Jordan	C	46	1				
Turkey (see Turkey in Europe).							
EUROPE							
Albania	C	262					
Austria	C	51	5				
Belgium	C	158					
Bulgaria	C	967	12				
Czechoslovakia	C	546					
Denmark	C	146	16				
France	C	303					
Germany	C	7,946	60	1			
Gibraltar [1]	C	9					
Great Britain	C	[2] 26					
Malta and Gozo [1]	C	15					
Greece	C	646	51	6			
Hungary.[3]							
Italy	C	198					
Netherlands	C	66	1				
Norway	C		8				
Poland	C	13,928	281				
Portugal	C	52					
Rumania	C	8,244					
Spain	C	26	1				
Sweden	C	226					
Switzerland	C	6					
Turkey	C	2,598	197	44	38	56	
Yugoslavia	C	2,285					

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; P, present]

Place		January–November 1945	December 1945	January 1946—week ended— 5	12	19	26
NORTH AMERICA							
Canada [1]	C	1					
Costa Rica [1]	C	12					
Cuba [1]	C	13					
Guatemala	C	2,343	28				
Jamaica [1]	C	56	3				
Martinique [1]	C	1					
Mexico	C	1,687					
Panama (Republic)	C	4	1				
Puerto Rico [1]	C	177					
Virgin Islands [1]	C	12	1				
SOUTH AMERICA							
Argentina	C	9					
Bolivia	C	717					
Brazil	C	8					
Chile [1]	C	604					
Colombia	C	422					
Curacao	C	3	1				
Ecuador	C	516					
Peru	C	718					
Venezuela [1]	C	136	8				
OCEANIA							
Australia [1]	C	116					
Hawaii Territory [1]	C	90					

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.
[1] Reports cases as murine type.
[2] Includes imported cases.
[3] For the period Jan. 1 to Sept. 1, 1945, between 8,000 and 10,000 cases of typhus fever were reported in Hungary.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January–November 1945	December 1945	January 1946—week ended— 5	12	19	26
AFRICA							
Gold Coast	C	[1] 13					
Nsawam	C	[2] 3					
Takoradi	C	1					
Tamale	C	[3] 1					
Winneba	C	[4] 4					
Ivory Coast:							
Gaoua	C	1					
Guiglo	C	1					
Sierra Leone: Moyamba	C	2					
Sudan (French): Bamako	C	[3] 1					
SOUTH AMERICA							
Bolivia:							
Beni Department	C	1					
La Paz Department	C	2					
Santa Cruz Department	D					[3] 39	
Brazil:							
Goiaz State	D	76					
Minas Geraes State	D	25					
Para State	D	1					
British Guiana: Kwakwani	C	1					
Colombia:							
Magdalena Department	D	3					
Putumayo Commissary	D	1					
Santander de Norte Department	D	19					
Peru:							
Cuzco Department	C	3					
Junin Department	C	[5] 6					
Loreto Department	C	1					
Venezuela:							
Bolivar State	C	1					
Merida State	C	3					
Tachira State	D	20					
Trujillo State	C				2		
Zulia State	C	8					1

[1] Includes 4 suspected cases.
[2] Includes 2 suspected cases.
[3] Suspected.
[4] Includes 1 suspected case.
[5] Includes 3 suspected cases.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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EDITORIAL[1]

Since its inception in July 1944, the Tuberculosis Control Division of the United States Public Health Service has made many advances toward a realization of its long-range objective—the eradication of tuberculosis in the United States. Beginning as a section of the States Relations Division of the Bureau of State Services, the initial work of the original staff demonstrated the need for a Federal program of tuberculosis control. This need was recognized by Congress when, under the authority invested in the Public Health Service by Public Law 410, the Tuberculosis Control Division was created to carry forward a campaign against this disease.

Until the establishment of the Division, programs against tuberculosis had been conducted largely by volunteer agencies, led by the National Tuberculosis Association, and by State and local health departments. These groups continue to do excellent work, and the Tuberculosis Control Division in no sense replaces any of them. Rather, it is the function and the purpose of the Division to fortify and to integrate, by means of technical, advisory, research, and financial aids, all existing agencies which are working toward the goal of eradication.

Now, after nearly 2 years, the Division can confidently announce material progress. Its four major objectives—case finding, medical care and isolation, aftercare and rehabilitation, and protection of the tuberculous family against economic distress—have been guiding principles which have produced significant findings and have created policies and procedures for the future.

In case finding the photofluorograph has been the major tool. It

* This is the first of a series of special issues of PUBLIC HEALTH REPORTS containing articles devoted exclusively to tuberculosis control, which will appear the first week of each month.

[1] From the Office of the Chief, Tuberculosis Control Division.

permits the examination of large population groups, whereas before this instrument was brought to its present state of refined development, only individuals and families could be reached by the standard X-ray equipment. Now the X-ray goes to the people, finds them in large groups, and discovers tuberculosis, in overwhelming proportion, in its minimal stage. The importance of this finding is made clear by the fact that in recent years only 10 to 15 percent of admissions to tuberculosis hospitals were minimal cases. Today, with modern case-finding techniques, 65 to 70 percent of all cases found are minimal. Tuberculosis, therefore, is at last being found when it can be relatively easily arrested. Continuing effort in this area of action must, however, be reinforced by vigorous community accomplishments in medical care and hospitalization of all discovered cases. Through grants-in-aid and consultation that springs from experience and research, the Federal Government is assisting the States in the study and solution of their tuberculosis problems.

Through its consultants in rehabilitation and medical social work and through its public health nurses, the Division is now undertaking a concentrated attack on the complex problems of rehabilitation and aftercare. In addition, the Division is assisting in the promotion and development of a national plan to provide adequate financial protection for the family of the tuberculous person against loss of wages during periods of long disability. An extension and strengthening of our present social security laws is patently called for if the campaign against tuberculosis is finally to succeed.

The Division has also expanded its activities in the field of research. Nearly one-third of a million dollars has been appropriated from operational funds for this purpose during the present year, and work in progress promises results important to all workers in tuberculosis control.

In consequence of this increased and extended action, it is thought appropriate and useful to report to the medical and allied professions the current results of the many divisional activities. Through the courtesy of the Division of Public Health Methods, it is now possible to publish, in the first week of every month, a special tuberculosis issue of PUBLIC HEALTH REPORTS. This issue will bring to the attention of the thousands of workers in the field discussions, announcements, and reports on research of all kinds from the scientific, administrative, and statistical units of the Tuberculosis Control Division, as well as contributions from consultants, private specialists, and research workers throughout the Nation.

REHABILITATION AND AFTERCARE IN TUBERCULOSIS[1]

I. GENERAL PROBLEMS

By Herman E. Hilleboe, *Medical Director*, and Norvin C. Kiefer, *Surgeon, United States Public Health Service*

Rehabilitation and aftercare are absolute essentials for the tuberculous, as well as for all physically handicapped persons. Rehabilitation commonly is thought of as the process of restoration of economic self-sufficiency to a disabled person. There are, however, a few diseases in which rehabilitation is a much more complex problem. Tuberculosis is an outstanding example, because it is resistant to complete cure and always likely to recur. In this disease rehabilitation must serve the added purposes of protecting the patient against recurrence and the public health against spread of the disease. Failure to utilize all safeguards to keep the tuberculous person permanently well encourages continued spread of the disease and wastes the funds which are spent on the initial diagnosis, medical care, and hospitalization of the patient.

Over one hundred million dollars are being spent each year on the maintenance of over 90,000 tuberculosis sanatorium beds. Of the 57,000 persons who died of this disease in 1943, almost half (45 percent) were men and women between the ages of 20 and 44 and one-fourth (24 percent) were men between the ages of 45 and 64. These are the years of heaviest social and familial responsibility and maximum wage-earning capacity. Most of these deaths were premature and needless. They have influenced profoundly and adversely the lives of countless dependents. Such deaths and their unhappy effects will continue indefinitely as long as our tuberculosis control programs fail to utilize the full scope of our national resources in preventive measures.

The greatest number of tuberculous persons reported as rehabilitated in the United States in any one year to the Office of Vocational Rehabilitation was 3,043 in 1943. Siltzbach[2] has estimated that there are 65,000 to 75,000 tuberculous persons who need rehabilitation annually in this country. Even if a number only half as large is used, for the sake of conservatism, this figure still would mean that less than 10 percent of the tuberculous persons who require rehabilitation actually receive such assistance.

The four major objectives of the Tuberculosis Control Division of the United States Public Health Service are: (1) Case finding to discover all tuberculosis in an early stage; (2) adequate treatment and isolation facilities for all patients; (3) aftercare and rehabilitation; (4) protection of the patient's family against economic distress.

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[1] From the Tuberculosis Control Division.

[2] Siltzbach, Louis E.: Clinical Evaluation of the Rehabilitation of the Tuberculous. National Tuberculosis Association, New York, 1944.

We are slowly achieving the first and second objectives on a Nationwide scale. Treatment and isolation facilities, however, are still far from adequate, for they vary widely among the States and much work must be done before diagnostic and therapeutic facilities are expanded sufficiently to meet the needs of the Nation's tuberculous. The principles of treatment and isolation accepted as basic requirements of good tuberculosis control will be applied as funds are provided.

The success of the first two measures, however, depends upon the achievement of the last two—rehabilitation of the patient and protection of the family against economic distress. Unfortunately, we find that the States are less ready to recognize the necessity and value of these last two services than they are to admit the urgency of case finding and treatment and isolation. There is a tendency to regard rehabilitation and aftercare and protection against economic distress as auxiliary services instead of fundamental needs. They are thought of as gifts discriminately bestowed rather than as a capital investment in the present to avoid perpetual and larger expenditures in the future. They are thought of merely as benefits to individuals, when actually their greatest benefit lies in the protection they afford the community against the spread of tuberculosis and against repeated financial outlay for rehospitalization of the same persons.

Public Law 113, known as the Vocational Rehabilitation Act, approved July 6, 1943, defines rehabilitation as follows: "The term vocational rehabilitation' and the term 'rehabilitation services' mean any services necessary to render a disabled individual fit to engage in a remunerative occupation." Michael J. Shortley, Director of the United States Office of Vocational Rehabilitation, has classified the services now available under the program of that Bureau into five general headings: Social adjustment, training and guidance, financial assistance, physical restoration, and employment. In the broadest sense, the period of rehabilitation might be said to start with the diagnosis and earliest social service investigations. The period then extends through counseling, occupational therapy, education, prevocational advice and training, vocational testing and counseling, through vocational training both in the sanatorium and after discharge, to placement in a suitable job after completion of vocational training. The final step is follow-up of both the patient's physical and rehabilitation status for a considerable period of time. Vocational rehabilitation is only one phase of the complete process of rehabilitation.

The path to full realization of an extensive rehabilitation project will be a tortuous one, beset with difficulties and formidable obstacles. These problems must be recognized and the difficulties anticipated in order that an appropriate attack may be made to insure eventual success.

A basic difficulty which challenges the progress of all phases of rehabilitation work is the present state of confusion over the scope of the work of various professional groups. There is even confusion over the very fundamental terms used. There is urgent need for specific definition of the nomenclature employed. A glaring example is the diversity of interpretations of the word "rehabilitation" itself. What is rehabilitation in relation to tuberculosis: what does it include? We equivocate by stating, "rehabilitation in its broadest sense." What is its "broadest sense"?

Sharp delineation of the boundaries of the activities of various rehabilitation groups probably cannot be drawn at this time. A certain amount of overlapping must occur when physicians, nurses, psychologists, occupational therapists, medical social workers, and many others work jointly on any problem. But it is incredible that these various groups cannot, in joint session, work out a practicable plan that will clearly outline the sphere in which each is to operate, with allowance made, of course, for necessary and appropriate bulges. Without such cooperative action, the outcries of wounded feelings threaten to drown out the voice of progress in rehabilitation to such an extent as to stalemate the entire program. Each of these groups has contributed much to rehabilitation, but the time has come for a serious endeavor to coordinate their efforts.

Another prime necessity is that of developing criteria for the determination of the proper time to start various phases of the rehabilitation program, and of the kind of work to be allowed the patient, both at the outset and after his eventual discharge from the sanatorium. It must be remembered that the patient sees rehabilitation as a preparation for a maximum amount of economic independence; furthermore, it serves as a tremendous boost to morale. Rehabilitation should begin no later than the day the patient enters the sanatorium, because from the beginning he must know that there is still a future for him. This knowledge acquired early in illness makes a great difference in his morale and his manner of adjustment to a changed way of life.

Rehabilitation is a form of treatment. Obviously, during the period of diagnosis and early hospitalization, medical care is paramount; but, at some point during the period of hospitalization, vocational guidance and training constitute a large portion of treatment and are continued into the immediate post-sanatorium period. As the patient improves clinically, rehabilitation is intensified until he is ready for discharge, at which time part-time work is permitted. Later the patient gradually acquires a mastery of some skill and finally secures a full-time job.

As yet, however, there is no general agreement as to when the process of rehabilitation can be instituted and when each new phase

can be added. Widespread adoption of more specific policies is needed in addition to full realization of individual variations and the necessity of amendments based on subsequent experience.

Although there is no uniformity of opinion about suitable employment for ex-tuberculous individuals, the present tendency is to extend greatly the scope of these activities. If we exclude those jobs which have been proved to be hazardous because they involve extreme physical exertion, and excessively long hours or exposure to unfavorable hygienic conditions, there probably remain very few occupations which threaten the patient's health. To these must be added those jobs on which the tuberculous worker would endanger the health of other individuals. It also should be borne in mind that contentment and mental equanimity which are a consequence of work which the patient enjoys may prove to be far more important than the actual amount of activity expended. The solution of this problem will come from extensive experience in the employment of the tuberculous ex-patient, not from long, arbitrary lists of suitable occupations.

It is difficult at the present time to estimate the actual cost of rehabilitation of a tuberculous patient. Financially, there are three factors to be weighed against the actual per-patient cost of rehabilitation: (1) The cost of readmissions can be expected to be greater in number without benefit of rehabilitation; (2) the cost of maintenance of the patient and his family when the breadwinner is not economically independent; (3) the cost of caring for persons infected by a relapsed patient.

The first of these factors, cost of readmissions, can be influenced in two different ways by proper rehabilitation. The first method is placement in suitable work under controlled conditions. The second method assumes that the number of sanatorium discharges against medical advice will decrease with the realization that such action discontinues vocational training of future financial value as well as medical care.

The second factor is fundamental in vocational rehabilitation—restoration to economic self-sufficiency. Proper training should make possible larger incomes than would otherwise have been possible. Those already skilled can use the period of sanatorium confinement to increase proficiency. Housewives and others who do not earn a salary can be trained to perform their daily tasks with a minimum of effort.

No one has been able to estimate the cost to the community involved in the third factor—caring for persons infected by relapsed tuberculous patients. Probably, the cost is very high in both lives and money. Without vocational rehabilitation, the person recently discharged from a sanatorium has little choice but to return to the type of work he performed in the past, and the same factors that

precipitated the original breakdown may soon bring about a second one. The actual breakdown is preceded by a gradual decrease in strength, during which time the patient finds himself unable to work steadily. Untrained, economically insecure, he will gravitate to low-paid jobs of temporary and strenuous nature. If these require physical labor, he may do himself additional harm. Many such jobs, such as dishwashing, food-handling, domestic work, and care of children, render the tuberculous worker a danger to public health.

Even the patient who may return to work that requires a minimum of physical exertion cannot resume his job immediately upon leaving the sanatorium. At first, he has physical strength for only a limited number of hours of daily work. He needs time to rebuild full work tolerance and to bring his skill back to former standards.

In the past, the major proportion of tuberculosis was found only after it had reached an advanced stage. Over the years this situation made a profound impression on public opinion. It was corroborated by sanatorium statistics and reports which revealed that only 1 person in 10 entering a tuberculosis hospital had early or minimal disease. Today, with mass radiography of millions of adults in the military services and in civilian industrial groups, we find two-thirds of the tuberculosis cases still in the minimal stage and amenable to therapy. In this group it appears that the best therapeutic results can be obtained; moreover, this group also yields the greatest returns from a good rehabilitation program, although the groups in the more advanced stages are by no means excluded.

At the present time there are several different general types of rehabilitation programs in practice, and it is difficult to assess these projects comparatively. As a prelude to their consideration it might be well first to consider the types of tuberculous patients with whom the rehabilitation worker has to deal:

The tuberculous ex-patient with favorable prognosis.—If such a patient had a minimal lesion at the time of diagnosis and responded rapidly to treatment, the process of rehabilitation may not have progressed far before discharge from the sanatorium. For those who previously were engaged in suitable occupations, this condition usually will not be serious. Those whose former occupation was for any reason unsuitable will require, along with the more advanced cases, a complete rehabilitation program.

Some investigations indicate that the usual tuberculous ex-patients have employment records which compare favorably with those of the general population. To offset his somewhat increased absentee rate during occasional illnesses, the average tuberculous ex-patient has decreased absentee rate from nonmedical causes, presumably because fear of recurrence of disease or dismissal from employment have inculcated in him a greater respect for his job and because he is less inclined to overindulgence.

The chronic sputum-positive cases.—These can be further subdivided into the so-called good chronic cases and the permanently incapacitated ones.

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a. The "good chronics" quite often are comparable to the average tuberculous person from the standpoint of physical ability, but present the problem of endangering those with whom they work because of the persistence of bacteriologically positive sputum. Because of this complication, special disposition is necessary for these cases.

b. The second group of chronic sputum-positive patients are those who are permanently incapacitated.

c. Other individuals falling into this category are some of the far-advanced cases who will not necessarily have persistently positive sputum.

Because of the shortage of beds for the tuberculous, one of each three sanatorium beds is now occupied by these long-term irremediable cases. Many of these persons relapsed following their first sanatorium discharge, because they received no assistance in making physical and economic adjustment to an indifferent or hostile world. A few hundred dollars spent on rehabilitation during their period of initial illness might have saved many times that amount in rehospitalization costs.

Each of these types of tuberculous ex-patients requires a different kind of rehabilitation program. Let us now turn to a consideration of the types of programs which exist:

1. *Colony plan.*—This is one of the oldest types, and its main development has been in Europe, particularly in England. This plan establishes in the sanatorium group a colony to which the patient moves after completion of hospitalization. He and his family live here, and he works here. Although such colonies have many advantages, they have not been established in the United States. Because of the size of this country, such colonies cannot be located, save in prohibitive numbers, in satisfactory proximity to the homes of the patients. Nor are they fitted to American individualism. In addition, such colonies industrially are not practical because usually they are too far removed from shipping and other necessary facilities and because they are limited in scope of activity.

2. *In-sanatorium employment.*—This is a commonly used method which offers a satisfactory solution to many cases, particularly among the "good chronic" group. The number of positions, however, is necessarily limited, and again the geographic problem is encountered.

3. *Home-bound employment.*—This method is highly unsatisfactory, but, in the case of the permanently incapacitated person, it frequently is the only one possible. Although a few patients have developed highly remunerative home-bound projects, the great majority of cases earn little or nothing, and the program is therefore mainly a means of passing the time.

4. *Sheltered workshop.*—This scheme has attracted considerable attention. Such shops offer training and employment under carefully controlled, sheltered conditions, with suitable hours, adequate rest periods, attention to diet, and, in most cases, medical supervision. Usually the worker is paid a small wage while he is learning, and this amount is gradually increased as he becomes more proficient in his work. In spite of the excellent record shown by some of these institutions, there are serious objections. They present the same geographical problem mentioned previously. Work opportunities are usually limited to one or a few fields, so that the ex-patient must adapt himself, like it or not, to the kind of employment offered. The overhead is usually large and the wage scale comparatively low, with the result that almost without exception the worker's income must be complemented by eleemosynary funds in order to support the family.

5. *The role of industry.*—Absorption of ex-patients into private industry offers many advantages. If a large enough number of industries would cooperate, the geographical problem could be solved. Overhead which is high in the sheltered workshop here would be relatively small, because the ex-patient would have employment in an already established industrial concern. A more or less unlimited variety of occupations could be offered. The pay scale almost certainly would be higher. Even the chronic sputum-positive cases could be placed in a special department where only such individuals were employed, thus avoiding the possibility of exposure to others. The only serious disadvantage to the industrial method is the difficulty of convincing industrial employers of the desirability of such a program and its necessary medical supervision.

6. *State-wide programs.*—Analysis of the disadvantages of the above programs would seem to indicate that the primary objection to most of them is that of too sharp localization of available jobs. This and many of the other difficulties probably can best be solved by consolidation of the various programs into State-wide systems. In this manner State agencies such as the State Tuberculosis Control Division, the Vocational Rehabilitation Office, the Department of Education, and all allied agencies can coordinate their work to a single purpose. Consultation facilities and financial assistance would be available through Federal agencies and national and State voluntary organizations without duplication of effort or expense. Far from being too complicated or unwieldy, such a plan can eventually simplify the control of the many tuberculosis rehabilitation problems. Several States already are making progress with such systems. Sheltered shops, homebound employment, in-sanatorium employment, industrial cooperation, and perhaps even, to a limited extent, colonies—all can be utilized and their various activities unified in one over-all program, directed by competent State officials. Thus this plan would have all of the advantages of the more limited systems, and at the same time inherit very few of the disadvantages.

Only when such programs achieve national scope and are strengthened by invalidity insurance can we have permanently successful and progressive tuberculosis control. It is encouraging to see that a Nation-wide rehabilitation scheme for all disabled persons is at last in sight, and that the Federal Government has officially expressed deep interest in this work. Federal participation in vocational rehabilitation has helped to strengthen State programs. The Federal-State partnership operating under the Barden-La Follette Act of 1943 has greatly extended the scope of these services and has made them available to groups, including the tuberculous, not covered by earlier provisions. This program is administered by the Office of Vocational Rehabilitation which, like the Public Health Service, is part of the Federal Security Agency.

The eventual possibility of combining some of the rehabilitation projects relating to various types of disabilities should also be mentioned. It seems certain that several such projects will soon be started on at least an experimental basis. From the point of view of administrative and operating expenses, these projects have real merit. Certainly many institutions have been highly successful in conducting the rehabilitation of widely varying types of orthopedic disabilities. There is, however, considerable question about the feasibility and

sible for the individual to obtain other than approved employment, there would not be a coincidental relief of the patient's mental conflict unless the necessary adequate financial assistance were supplied. The probably deleterious effects of emotional problems and mental discontent on the tuberculous ex-patient's physical well-being has been discussed previously.

The success of each of the four objectives of the Tuberculosis Control Division of the United States Public Health Service—case finding, treatment and isolation, aftercare and rehabilitation, and protection against economic distress—is dependent on the success of each of the others. There can be no rehabilitation without preceding medical care, but at the same time, treatment is not complete nor secure until complete rehabilitation has been assured. Completion of each of these phases will be endangered constantly so long as the patient and his family are economically insecure. The first, or case-finding phase, is necessary to search constantly for new or previously unrecognized cases of tuberculosis, so that the last three phases may be brought into operation.

When all four phases of the program have been brought into highly efficient operation on a Nation-wide basis, the final *coup de grace* may then be dealt to this ancient and vexing problem. Many weighty problems remain to be solved in the field of rehabilitation and aftercare of the tuberculous. It has been the purpose of this paper to point out some of the more serious ones with general suggestions as to the possible pathways to their eventual conquest.

PHOTOFLUOROGRAPHIC ROLL-FILM VIEWERS [1]

By IRA LEWIS, *Surgeon (R), United States Public Health Service*

There has long been a controversy between American and British authorities regarding the type of viewer best suited for the interpretation of photofluorographic films. For the most part direct viewing systems have been used in America, whereas in Great Britain (*1*) the projection system has been preferred.

The British projection system of viewing employs a simple projector using a 100-watt incandescent bulb as a light source. The image is projected on a white flat screen at a distance of approximately 3½ feet and covers an area of approximately 8 by 10 inches. Other image sizes can obviously be obtained by using other projector-screen distances, but an image size of 8 by 10 inches is considered optimum by most British workers. A flat rather than granular type of screen is used in order to reduce unsharpness to a minimum. Customarily,

[1] From the Radiology Section, Tuberculosis Control Division.

the projector is operated in a darkened room by a projectionist, although, if necessary, the interpreter of the film may operate the projector.

The direct type of viewer which has been, until recently, used most widely in America to interpret 35-mm. photofluorographic films is illustrated in figure 1. It consists of a simple lens system 3 inches in diameter which magnifies the image approximately 2½ times. It includes a 7½-watt incandescent lamp as the light source. The filament temperature of the lamp can be adjusted by a rheostat on the side of the viewer. The device is manufactured by E. Leitz, Inc., New York, N. Y.

In addition to the viewer illustrated in figure 1, there will soon be available another direct viewer for 35-mm. film interpretation. This device is shown in figure 2 and will be manufactured by the Westinghouse Electric Corporation. It possesses a magnification of approximately 2 times and utilizes a reflection type of lens system. A fluorescent lamp will be used as a light source. This viewer also may be employed for the interpretation of 70-mm. photofluorographic films. The General Electric and the Fairchild Camera and Instrument Companies have in production direct-system viewers utilizing conventional lens systems also in the 70-mm. category. Both of these latter viewers are so designed as to permit the interpreter to read the films either with or without magnification.

In an attempt to resolve the relative merits of projection and direct viewing systems, a quantitative study of the subject has been undertaken in the laboratory of the Radiology Section of the Tuberculosis Control Division. The results of this investigation are presented in the paragraphs below.

Fundamentally, the optimum conditions under which photofluorographic films are viewed require that the following criteria be observed:

1. All detail which is present in the film must be reproduced at the retina of the observer's eye.
2. Eyestrain must be reduced to a minimum.
3. Mechanical operation of the viewing device must be as simple as possible.

The detail which a roentgen image exhibits is a function of the maximum resolving power of the radiographic film on which the image is recorded. Measurements of the resolving powers of photofluorographic films, conducted according to the method proposed by Morgan (*2*), indicate that 35-mm. Eastman green-sensitive film, exposed under normal photofluorographic conditions (i. e., with a Patterson type B fluorescent screen and with an Ektar f/1.5 lens) has an inherent maximum resolving power of 0.9 serrations per millimeter. Eastman 70-mm. blue-sensitive film (exposed with a Patterson type D fluorescent screen and with an Ektar f/1.5 lens) has an inherent resolving

power of 1.5 serrations per millimeter. The maximum resolving power which may be actually visualized when the 35-mm. film is viewed by the British projection method is 0.75 serration per millimeter. It is clear, therefore, that there is a loss in resolution of approximately 15 percent introduced by the unsharpness of the projection-lens system. The resolving power of the same 35-mm. film when observed on the Leitz viewer is 0.6 serration per millimeter. Thus, from the standpoint of ability to record detail there is a definite advantage in favor of the projection system over the heretofore available direct viewing systems. When the 35-mm. film is observed on the new Westinghouse type of viewer, however, the visible resolving power approaches 0.9 serration per millimeter. That is, this type of viewer introduces no loss in resolving power between the film and the interpreter's retina. Accordingly, this viewer may be considered somewhat superior to the projection system. Tests made with the General Electric and Fairchild viewers with 70-mm. film indicate that these viewers too are able to record on the observer's retina all of the detail which is present in the film.

It is well known that eyestrain which may be experienced by an observer interpreting photofluorographic film will approach a minimum when the distance between the eye and the virtual image of the film appearing in the viewing system is approximately 100 cm. Under these conditions normal convergence occurs and accommodation is obtained with a minimum of difficulty. When the distance approaches 40 cm. or less eyestrain becomes severe because of the abnormal convergence and accommodation required of the eyes.

Under normal conditions the screen in the British projection system is viewed at a distance of approximately 100 cm., whereas the viewing distance with the Leitz viewer is approximately 40 cm. It is evident, therefore, that the eyestrain experienced by an observer will be considerably less with the projection system than with the Leitz viewer. The viewing distance in the Westinghouse, General Electric, and Fairchild viewers, however, approaches the 100-cm. level. Accordingly, one may expect to use these viewers with as little discomfort, from the standpoint of eyestrain, as is the case when the same observer is using the projection system of viewing.

In regard to the mechanical operation of the projection and direct viewing systems, the former system possesses several disadvantages. First, the amount of heat developed about the projector is great, thereby causing the observer considerable discomfort. Second, the need for a darkened room is inconvenient, since it increases the difficulties in recording the observer's findings. Finally, the need for a projectionist in addition to the individual interpreting the films is uneconomical.

FIGURE 1.

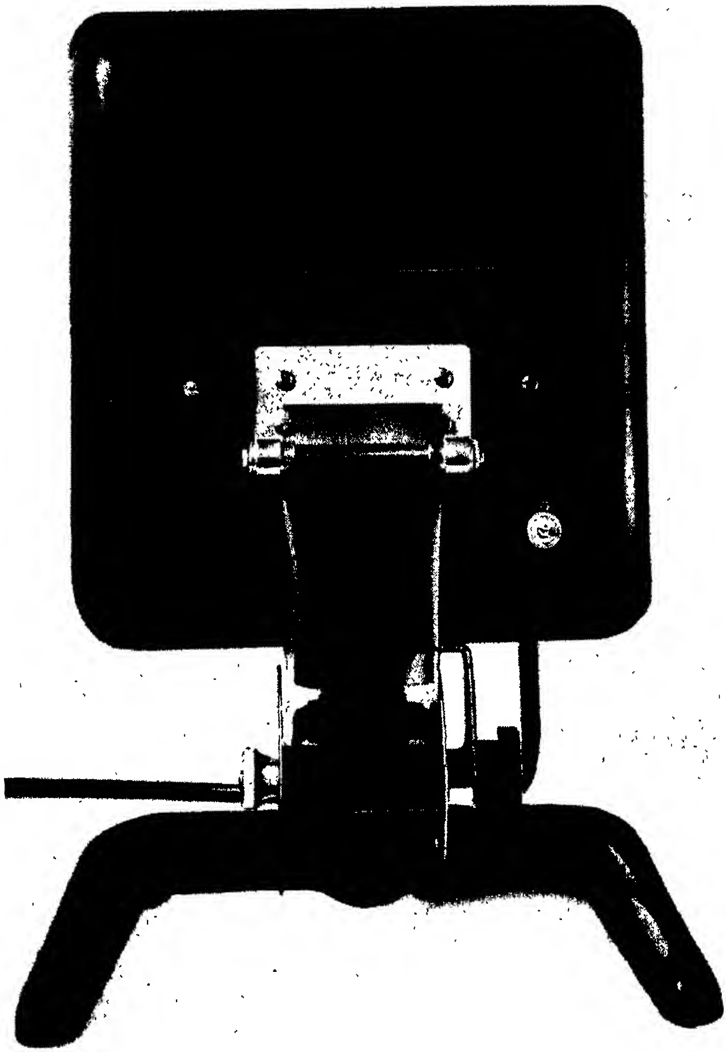

FIGURE 2.

From the foregoing it is clear that the projection system of viewing has been in many respects preferable to the direct system of viewing in the past. Due to incorrect design the direct viewers which have been available have provided poor reproduction of detail and have been the cause of considerable eyestrain. The direct viewers which are now becoming available overcome these difficulties, and since they do not have the mechanical disadvantages of operation inherent in projection systems of viewing, it is felt that they offer the closest approach to the ultimate in viewing system design.

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TUBERCULOSIS MORTALITY IN MAJOR CITIES: UNITED STATES, 1942–43[1]

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As a cause of death, tuberculosis presents a relatively greater problem in the large cities of the United States than in smaller cities or rural areas. In the 2-year period, 1942–43, tuberculosis was assigned as the cause of 4.6 percent of all deaths among residents of cities of 100,000 or more population, while among those living in rural areas and smaller urban places it was the cause of 4.0 percent and 3.6 percent, respectively, of the deaths from all causes.

Within the group of large cities, there is a wide range in the relative importance of tuberculosis as a cause of death. The proportion of deaths due to tuberculosis varies from less than 2 percent in some cities to nearly 10 percent in others. If the lower figures may be regarded as attainable goals and the higher figures as signposts for the guidance of control efforts, then it is of importance to determine how the mortality from tuberculosis in one city compares with that in the others. Such comparisons, based on tuberculosis death rates, have been made for earlier years by Liveright (*1*), the New York Tuberculosis and Health Association (*2*), and the National Tuberculosis Association (*3*).

The purpose of this paper is to present data on tuberculosis mor-

[1] From the Tuberculosis Control Division, U. S. Public Health Service, and the Vital Statistics Division, U. S. Bureau of the Census.

(Note: This paper is in part a summary of a longer study with the same title and by the same authors, published by the Bureau of the Census as a Vital Statistics-Special Report (vol. 21, No. 14). Detailed data are given on tuberculosis mortality in the 92 large cities by age, race, and sex for 1942–43 and 1939–41, with a discussion of the 1942–43 material and of the changes between the two periods.)

tality by race for residents of the 92 cities of 100,000 or more population for the two periods, 1942-43 and 1939–41, to rank [2] the cities according to their mortality from tuberculosis in 1942–43, and to determine the changes in tuberculosis mortality between 1939–41 and 1942–43.

Because of the lack of population estimates necessary for computing death rates, the death ratio or proportionate mortality is used in this paper. This measure relates the number of deaths from a specific cause (in this case, tuberculosis) to the number of deaths from all causes. All required data, the number of deaths from tuberculosis and the number of deaths from all causes, are readily available from both local and Federal sources.

PROPORTIONATE MORTALITY

Since the death ratio or proportionate mortality has been less commonly used in recent years than the death rate, it may be well at the outset to discuss briefly its meaning and its relation to the death rate.

The tuberculosis death ratio expresses the relative importance of tuberculosis as a cause of death, measuring the relation of the mortality from tuberculosis to the total mortality problem. It is a useful supplement to the death rate and a valuable measure in its own right when used with a full understanding of its limitations.

From a comparison of the tuberculosis death ratio for one community with that for another it is possible to determine the difference between the two communities with respect to the importance of tuberculosis relative to the total mortality problem. For a given community the movement of the tuberculosis death ratio over a period of time reveals the course of the tuberculosis death rate relative to the general death rate. If the ratio increases, the tuberculosis death rate is either rising faster or decreasing more slowly than the general death rate; if it remains constant the two are following the same course; if the ratio decreases, the tuberculosis death rate either has dropped more rapidly or has risen more slowly than the total death rate. Since there exists a considerable body of knowledge concerning tuberculosis and its prevention, it is not, under normal conditions, too extreme to expect the tuberculosis death rate to decrease more rapidly than the general rate, the condition shown by declining death ratios.

Among the important factors affecting the death ratio are the composition of the population with respect to age, race, and sex and the general mortality situation. A community with a large proportion

[2] To facilitate intercity comparisons the cities will be ranked in order of their tuberculosis death ratios for each of the three race groups, all races, white, and nonwhite. Rankings will also be given by race for four city population-size groups, and four geographic regions. In all rankings the city with the lowest proportionate mortality is ranked in first place up to the city with the highest one, which is ranked ninety-second. As an aid in locating the cities in the various rankings, table 11 gives the cities in alphabetical order and their position in each of the rankings.

of its population at the younger ages where the number of deaths from all causes is relatively small may have a rather high tuberculosis death ratio, while an area having a large proportion of its population at the older ages where the number of deaths from all causes is large may have a rather low death ratio. Thus in some cases, tuberculosis death ratios may differ because of differences in the composition of the populations rather than because of any real difference in tuberculosis mortality. The effect of such differences may be controlled in large measure by the use of death ratios specific for age, race, and sex.

Under the conditions of an epidemic, the utility of the death ratio may be greatly diminished. When a large increase occurs in the number of deaths from some cause other than tuberculosis, the denominator of the death ratio is increased and the tuberculosis death ratio may decline. The reverse of this situation may occur when there is a sharp decrease in the number of deaths from one or several major causes. In such situations the death ratio may be modified by elimination of these causes from the denominator of the ratio. (A fuller discussion of these considerations is given in the Vital Statistics—Special Report, see footnote 1.)

Since studies of the rank order of the 92 cities for earlier years have been based on the tuberculosis death rate, it is desirable to indicate briefly the relation between the tuberculosis death ratio and death rate and the degree of comparability between the rankings for earlier years and those given in this paper which are based on the death ratio.

The relation between the tuberculosis death ratio and the tuberculosis death rate for a community is a function of the community's death rate for all causes.[3] Consequently, for a group of cities having the same general death rate, the rankings based on the tuberculosis death ratio will be identical with the rankings based on the tuberculosis death rate.

For the period 1939–41 the general death rates for some of the 92 cities were found to differ greatly from the average for the group of cities. Cities with such extreme general death rates will exhibit considerable variation between their positions in the rankings by the

[3] The death rate from tuberculosis divided by the tuberculosis death ratio is equal to the general death rate. The relation is:

$$\frac{d}{P}=\frac{D}{P}\cdot\frac{d}{D} \text{ or } \frac{d}{P}\div\frac{d}{D}=\frac{D}{P}$$

where

d=deaths from tuberculosis
D=deaths from all causes
P=population

and

$\frac{D}{P}$=general death rate
$\frac{d}{P}$=tuberculosis death rate
$\frac{d}{D}$=tuberculosis proportionate mortality or death ratio.

tuberculosis death rate and by the tuberculosis death ratio, but for the majority of cities the rankings based on the two measures correspond fairly closely.[4] Moreover, for each city the ranking on the basis of the tuberculosis death ratio affords an intercity comparison of the importance of tuberculosis as a cause of death relative to the total mortality.

TUBERCULOSIS DEATH RATIOS OF THE 92 CITIES

The 92 cities ranked according to their tuberculosis death ratios (per 100 deaths from all causes) for 1942–43 for all races are given in table 1, which also includes the ratios for 1939–41 and their percentage change between the two periods.

TABLE 1.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for 92 cities of over 100,000 population: United States, 1942–43 and 1939–41 (all races)*

[Cities are ranked according to the death ratios for 1942–43 by place of residence]

Rank	City	Death ratio 1942–43	Death ratio 1939–41 [1]	Percent change 1939–41 to 1942–43	Rank	City	Death ratio 1942–43	Death ratio 1939–41 [1]	Percent change 1939–41 to 1942–43
1	Salt Lake City, Utah	1.4	2.0	−30.0	44	Scranton, Pa	3.8	3.5	+ 8.6
2	Des Moines, Iowa	1.7	2.2	−22.7	48	Cambridge, Mass	3.9	3.8	+ 2.6
2	Spokane, Wash	1.7	2.0	−15.0	49	Columbus, Ohio	4.0	4.3	− 7.0
4	Grand Rapids, Mich	1.8	1.5	+20.0	49	Yonkers, N. Y	4.0	4.1	− 2.4
4	Long Beach, Calif	1.8	2.2	−18.2	51	Fort Worth, Tex	4.1	4.6	−10.9
6	Duluth, Minn	2.0	2.3	−13.0	52	Camden, N. J	4.2	4.4	− 4.5
7	Minneapolis, Minn	2.1	2.1	-------	52	Indianapolis, Ind	4.2	4.3	− 2.3
7	Utica, N. Y	2.1	2.2	− 4.5	54	Pittsburgh, Pa	4.3	4.6	− 6.5
9	Portland, Oreg	2.4	2.6	− 7.7	55	St. Louis, Mo	4.4	4.5	− 2.2
9	Syracuse, N. Y	2.4	2.9	−17.2	55	San Francisco, Calif	4.4	5.1	−13.7
11	Omaha, Nebr	2.5	3.2	−21.9	57	Buffalo, N. Y	4.5	4.2	+ 7.1
11	Peoria, Ill	2.5	2.4	+ 4.2	57	Youngstown, Ohio	4.5	4.2	+ 7.1
11	Wichita, Kans	2.5	2.5	-------	59	Knoxville, Tenn	4.6	5.9	−22.0
14	Somerville, Mass	2.6	2.7	− 3.7	59	Louisville, Ky	4.6	4.0	+15.0
14	Springfield, Mass	2.6	2.6	-------	59	New York, N. Y	4.6	5.1	− 9.8
16	Lowell, Mass	2.7	2.8	− 3.6	59	Tulsa, Okla	4.6	6.5	−29.2
17	Elizabeth, N. J	2.8	3.9	−28.2	63	Los Angeles, Calif	4.7	5.0	− 6.0
17	Flint, Mich	2.8	3.1	− 9.7	63	Philadelphia, Pa	4.7	5.2	− 9.6
17	Rochester, N. Y	2.8	3.0	− 6.7	65	Tampa, Fla	4.9	5.0	− 2.0
17	South Bend, Ind	2.8	4.0	−30.0	65	Toledo, Ohio	4.9	5.4	− 9.3
21	New Haven, Conn	2.9	3.0	− 3.3	67	Boston, Mass	5.0	4.7	+ 6.4
21	Worcester, Mass	2.9	2.8	+ 3.6	67	Chicago, Ill	5.0	5.7	−12.3
23	St. Paul, Minn	3.0	2.8	+ 7.1	67	Jersey City, N. J	5.0	5.2	− 3.8
24	Erie, Pa	3.1	3.3	− 6.1	67	Dayton Ohio	5.0	5.5	− 9.1
24	Tacoma, Wash	3.1	3.2	− 3.1	71	Dallas, Tex	5.1	5.6	− 8.9
26	New Bedford, Mass	3.2	4.4	−27.3	72	Cleveland, Ohio	5.2	5.5	− 5.5
27	Canton, Ohio	3.3	4.1	−19.5	72	Norfolk, Va	5.2	6.8	−23.5
27	Hartford, Conn	3.3	3.5	− 5.7	74	Cincinnati, Ohio	5.3	5.1	+ 3.9
27	Wilmington, Del	3.3	4.3	−23.3	75	Newark, N. J	5.5	5.9	− 6.8
30	Akron, Ohio	3.4	3.0	+13.3	75	Trenton, N. J	5.5	5.2	+ 5.8
30	Albany, N. Y	3.4	3.5	− 2.9	77	Miami, Fla	5.6	5.6	-------
30	Bridgeport, Conn	3.4	3.6	− 5.6	77	Richmond, Va	5.6	5.5	+ 1.8
30	Charlotte, N. C	3.4	4.6	−26.1	79	Nashville, Tenn	5.7	5.8	− 1.7
30	Fort Wayne, Ind	3.4	3.7	− 8.1	80	Detroit, Mich	5.9	6.0	− 1.7
30	Providence, R. I	3.4	3.4	-------	80	Houston, Tex	5.9	7.0	−15.7
30	Reading, Pa	3.4	4.4	−22.7	80	New Orleans, La	5.9	6.3	− 6.3

[1] 1940–41 only for Camden, N. J., Charlotte, N. C., and Sacramento, Calif.

[4] For the period 1939–41, the correlations between the tuberculosis death rates and the death ratios for the 92 cities based on 1940 census data were computed. (See appendix discussion in the Vital Statistics-Special Report.) The two measures are highly correlated for most of the age-race-sex divisions, and in general the correlation is higher for the white than for the nonwhite races, and for the older than for the younger ages. The coefficients of correlation varied from a value of 0.98 for white females over 65 years of age to 0.67 for nonwhite females aged 15–44.

TABLE 1.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for 92 cities of over 100,000 population: United States, 1942–43 and 1939–41 (all races)*—Continued

Rank	City	Death ratio 1942–43	Death ratio 1939–41	Percent change 1939–41 to 1942–43	Rank	City	Death ratio 1942–43	Death ratio 1939–41	Percent change 1939–41 to 1942–43
37	Kansas City, Kans.	3.5	4.1	−14.6	83	Gary, Ind.	6.0	7.2	−16.7
37	Oakland, Calif.	3.5	3.3	+ 6.1	84	Jacksonville, Fla.	6.2	7.1	−12.7
37	Seattle, Wash.	3.5	3.9	−10.3	85	Atlanta, Ga.	6.3	6.7	− 6.0
40	Fall River, Mass.	3.7	4.1	− 9.8	85	Baltimore, Md.	6.3	6.7	− 6.0
40	Kansas City, Mo.	3.7	4.3	−14.0	85	Washington, D. C.	6.3	6.9	− 8.7
40	Oklahoma City, Okla.	3.7	4.2	−11.9	88	Birmingham, Ala.	6.4	6.8	− 5.9
40	San Diego, Calif.	3.7	4.1	− 9.8	89	Memphis, Tenn.	6.5	7.9	−17.7
44	Denver, Colo.	3.8	4.5	−15.6	90	Sacramento, Calif.	7.2	6.7	+ 7.5
44	Milwaukee, Wis.	3.8	4.0	− 5.0	91	Chattanooga, Tenn.	8.4	8.9	− 5.6
44	Paterson, N. J.	3.8	2.9	+31.0	92	San Antonio, Tex.	9.9	11.0	−10.0

A great variation between the ratios is immediately evident. The maximum ratio of 9.9 in San Antonio is seven times the minimum value of 1.4 for Salt Lake City. Half of the cities have proportionate mortalities of less than 3.8, one quarter of the ratios are less than 3.0, and one quarter are greater than 5.0. Tuberculosis death ratios of 2.0 or less are found for six cities—Salt Lake City, Des Moines, Spokane, Grand Rapids, Long Beach, and Duluth, while tuberculosis accounted for 6 percent or more of all deaths in 10 cities—Gary, Jacksonville, Atlanta, Baltimore, Washington, Birmingham, Memphis, Sacramento, Chattanooga, and San Antonio.

An examination of the percentage changes from 1939–41 to 1942–43 shows that in the majority of cities the tuberculosis death ratios decreased during this period. The ratios for 70 cities, or 76 percent of the 92, declined, while 16 cities had increased ratios,[5] and in 6 cities no change took place. (See the Vital Statistics-Special Report for a fuller discussion of this topic, with reference to statistically significant changes.)

Table 2 presents the ranking of the 92 cities according to the tuberculosis death ratios for the white [6] population. The effect which the racial composition of the population of a city may have upon its death ratios, is strikingly illustrated by a comparison of the rank order in listings of the ratios for all races and whites for several southern cities having relatively large nonwhite populations. Birmingham, which is eighty-eighth in the ranking for all races, dropped to

[5] For each of the three race groups, all increases in the death ratios between 1939–41 and 1942–43 were tested for statistically significant change. Of these only the ratios for Paterson and Louisville for all races and for Louisville for whites showed statistically significant change.

[6] A race division was made for cities in which the nonwhite population numbered at least 20,000 or when that group constituted 10 percent or more of the total population. (This was not followed in the case of Dayton in order to gain comparability with data for 1939–41 when a race division was not available.) There were 39 cities which fulfilled this condition, and therefore had their mortalities tabulated for both whites and nonwhites. In the other 53 cities the nonwhites constitute such a small proportion of the total that the death ratios for all races are, for all practical purposes, the same as those for the white population and therefore are used in table 2.

twenty-first in that for whites, while Jacksonville changed from eighty-fourth to twenty-sixth, and Norfolk from seventy-second to ninth.

Since the data in the listings for whites and all races are identical for 53 of the cities (see footnote 6), it is to be expected that the 2

TABLE 2.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for 92 cities of over 100,000 population: United States, 1942–43 and 1939–41 (white)*[1]

[Cities are ranked according to the death ratios for 1942–43 by place of residence]

Rank	City	Death ratio 1942–43	Death ratio 1939–41[2]	Percent change 1939–41 to 1942–43	Rank	City	Death ratio 1942–43	Death ratio 1939–41[2]	Percent change 1939–41 to 1942–43
1	Salt Lake City, Utah	1.4	2.0	−30.0	44	Fort Wayne, Ind	3.4	3.7	− 8.1
2	Des Moines, Iowa	1.7	2.2	−22.7	44	Providence, R. I	3.4	3.4	-------
2	Spokane, Wash	1.7	2.0	−15.0	44	Reading, Pa	3.4	4.4	−22.7
4	Grand Rapids, Mich	1.8	1.5	+20.0	50	Cincinnati, Ohio	3.5	3.3	+ 6.1
4	Long Beach, Calif	1.8	2.2	−18.2	50	Louisville, Ky	3.5	2.9	+20.7
6	Duluth, Minn	2.0	2.3	−13.0	50	Memphis, Tenn	3.5	4.2	−16.7
7	Minneapolis, Minn	2.1	2.1	-------	50	Oakland, Calif	3.5	3.3	+ 6.1
7	Utica, N. Y	2.1	2.2	− 4.5	50	Seattle, Wash	3.5	3.9	−10.3
9	Norfolk, Va	2.2	3.5	−37.1	55	Atlanta, Ga	3.6	3.3	+ 9.1
9	Wilmington, Del	2.2	3.2	−31.3	56	Fall River, Mass	3.7	4.1	− 9.8
11	Charlotte, N. C	2.4	2.4	-------	56	Knoxville, Tenn	3.7	4.5	−17.8
11	Portland, Oreg	2.4	2.6	− 7.7	56	Newark, N. J	3.7	3.8	− 2.6
11	Syracuse, N. Y	2.4	2.9	−17.2	56	New York, N. Y	3.7	4.0	− 7.5
14	Omaha, Nebr	2.5	3.2	−21.9	56	Oklahoma City, Okla	3.7	4.2	−11.9
14	Peoria, Ill	2.5	2.4	+ 4.2	56	San Diego, Calif	3.7	4.1	− 9.8
14	Wichita, Kans	2.5	2.5	-------	56	Tampa, Fla	3.7	3.2	+15.6
17	Somerville, Mass	2.6	2.7	− 3.7	63	Chicago, Ill	3.8	4.3	−11.6
17	Springfield, Mass	2.6	2.6	-------	63	Denver, Colo	3.8	4.5	−15.6
19	Kansas City, Mo	2.7	3.2	−15.6	63	Milwaukee, Wis	3.8	4.0	− 5.0
19	Lowell, Mass	2.7	2.8	− 3.6	63	Paterson, N. J	3.8	2.9	+31.0
21	Elizabeth, N. J	2.8	3.9	−28.2	63	Scranton, Pa	3.8	3.5	+ 8.6
21	Flint, Mich	2.8	3.1	− 9.7	63	Tulsa, Okla	3.8	4.8	−20.8
21	Birmingham, Ala	2.8	3.5	−20.0	69	Cambridge, Mass	3.9	3.8	+ 2.6
21	Rochester, N. Y	2.8	3.0	− 6.7	69	Cleveland, Ohio	3.9	4.0	− 2.5
21	South Bend, Ind	2.8	4.0	−30.0	69	Fort Worth, Tex	3.9	4.0	− 2.5
26	Indianapolis, Ind	2.9	3.0	− 3.3	69	Gary, Ind	3.9	5.0	−22.0
26	Jacksonville, Fla	2.9	2.8	+ 3.6	69	Nashville, Tenn	3.9	4.4	−11.4
26	New Haven, Conn	2.9	3.0	− 3.3	69	Richmond, Va	3.9	3.3	+18.2
26	Worcester, Mass	2.9	2.8	+ 3.6	69	San Francisco, Calif	3.9	4.6	−15.2
30	Columbus, Ohio	3.0	3.0	-------	76	Baltimore, Md	4.0	4.1	− 2.4
30	St. Paul, Minn	3.0	2.8	+ 7.1	76	Yonkers, N. Y	4.0	4.1	− 2.4
32	Erie, Pa	3.1	3.3	− 6.1	78	Dallas, Tex	4.1	4.9	−16.3
32	Pittsburgh, Pa	3.1	3.5	−11.4	79	Los Angeles, Calif	4.2	4.4	− 4.5
32	Tacoma, Wash	3.1	3.2	− 3.1	79	New Orleans, La	4.2	4.6	− 8.7
35	Camden, N. J	3.2	3.5	− 8.6	81	Detroit, Mich	4.3	4.5	− 4.4
35	Kansas City, Kans	3.2	3.1	+ 3.2	82	Buffalo, N. Y	4.5	4.2	+ 7.1
35	New Bedford, Mass	3.2	4.4	−27.3	82	Youngstown, Ohio	4.5	4.2	+ 7.1
35	Washington, D. C	3.2	3.6	−11.1	84	Boston, Mass	4.6	4.3	+ 7.0
39	Canton, Ohio	3.3	4.1	−19.5	85	Houston, Tex	4.9	6.0	−18.3
39	Hartford, Conn	3.3	3.5	− 5.7	85	Toledo, Ohio	4.9	5.4	− 9.3
39	Miami, Fla	3.3	3.0	+10.0	87	Dayton, Ohio	5.0	5.5	− 9.1
39	Philadelphia, Pa	3.3	3.7	−10.8	87	Jersey City, N. J	5.0	5.2	− 3.8
39	St. Louis, Mo	3.3	3.2	+ 3.1	89	Chattanooga, Tenn	5.5	6.1	− 9.8
44	Akron, Ohio	3.4	3.0	+13.3	89	Trenton, N. J	5.5	5.2	+ 5.8
44	Albany, N. Y	3.4	3.5	− 2.9	91	Sacramento, Calif	7.2	6.7	+ 7.5
44	Bridgeport, Conn	3.4	3.6	− 5.6	92	San Antonio, Tex	9.9	11.0	−10.0

[1] For cities having a small nonwhite population (less than 20,000 or less than 10 percent of the total population according to the 1940 Census) the death ratios for all races are used to approximate those for the white population.

[2] 1940–41 only for Camden, N. J., Charlotte, N. C., and Sacramento, Calif.

rankings would exhibit many points of similarity. The values of the maximum and minimum ratios of 9.9 and 1.4 are the same for whites as for all races, and the cities shown in the first 8 positions and in the ninety-second, in the one listing are the same as those shown in the

other. On the other hand, while one quarter of the cities have ratios for all races of 5.0 or more, the ratios for whites in only 6 cities—Dayton, Jersey City, Chattanooga, Trenton, Sacramento, and San Antonio— exceed this value. The high ratio in San Antonio may be attributable in part to its large Latin-American population.

There were slightly fewer decreases from 1939–41 to 1942–43 among the ratios for whites than there were among those for all races. In 63 cities, or 68 percent of all 92, decreases occurred, while increases were found in the ratios for 23 cities, and in 6 no change took place.

The inroad which tuberculosis makes in the nonwhite population of the large cities is shown in table 3, where the 39 cities (see footnote 6)

TABLE 3.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes, for 39 cities*[1] *of over 100,000 population: United States, 1942–43 and 1939–41 (nonwhite)*

[Cities are ranked according to the death ratios for 1942–43, by place of residence[

Rank	City	Death ratio 1942–43	Death ratio 1939–41[2]	Percent change 1939–41 to 1942–43	Rank	City	Death ratio 1942–43	Death ratio 1939–41[2]	Percent change 1939–41 to 1942–34
1	Kansas City, Kans	4.5	7.4	−39.2	20	Columbus, Ohio	9.9	11.9	−16.8
2	Charlotte, N. C	4.6	7.0	−34.3	22	Jacksonville, Fla	10.1	11.8	−14.4
3	Fort Worth, Tex	4.9	7.4	−33.8	23	Indianapolis, Ind	10.2	10.7	− 4.7
4	Tampa, Fla	7.7	9.4	−18.1	24	Gary, Ind	11.2	13.1	−14.5
5	Wilmington, Del	8.1	9.4	−13.8	25	Washington, D. C	11.6	12.4	− 6.5
6	Richmond, Va	8.2	8.5	− 3.5	26	Chattanooga, Tenn	12.3	12.4	− .8
7	Knoxville, Tenn	8.3	10.5	−21.0	27	Pittsburgh, Pa	12.4	13.2	− 6.1
8	Dallas, Tex	8.4	7.7	+ 9.1	28	Los Angeles, Calif	12.6	13.8	− 8.7
9	Houston, Tex	8.5	9.2	− 7.6	28	Philadelphia, Pa	12.6	13.7	− 8.0
9	Louisville, Ky	8.5	8.3	+ 2.4	30	Baltimore, Md	12.9	14.2	− 9.2
11	Nashville, Tenn	8.6	8.0	+ 7.5	30	Miami, Fla	12.9	13.0	− .8
12	Kansas City, Mo	8.9	10.2	−12.7	32	Boston, Mass	14.0	12.9	+ 8.5
13	New Orleans, La	9.0	9.0	------	33	Chicago, Ill	14.1	16.2	−13.0
13	Tulsa, Okla	9.0	15.5	−41.9	34	Cleveland, Ohio	14.6	16.6	−12.0
15	Norfolk, Va	9.2	11.0	−16.4	35	San Francisco, Calif	15.0	17.5	−14.3
16	Atlanta, Ga	9.4	10.0	− 6.0	36	Cincinnati, Ohio	15.4	15.5	− .6
17	St. Louis, Mo	9.5	10.2	− 6.9	37	New York, N. Y	16.0	17.4	− 8.0
18	Memphis, Tenn	9.6	11.3	−15.0	38	Newark, N. J	16.2	18.8	−13.8
19	Birmingham, Ala	9.7	9.8	− 1.0	39	Detroit, Mich	16.4	15.9	+ 3.1
20	Camden, N. J	9.9	9.9	-------					

[1] Cities shown in this table are those in which the nonwhite population constitutes at least 10 percent of the total population or numbers 20,000 or more according to the 1940 Census.
[2] 1940–41 only for Camden, N. J., and Charlotte, N. C.

are ranked according to their tuberculosis death ratios for nonwhites. The ratios range from 4.5 in Kansas City, Kans., to 16.4 in Detroit. The three cities with the lowest ratios—Kansas City, Kans., Charlotte, and Fort Worth—have ratios of less than 5.0, which is equal to the ratio of the eighty-fifth city in the white ranking. Half of the cities have ratios of greater than 9.9, the maximum ratio for all races and whites.

A study of the rankings indicates that tuberculosis among non-

whites is a serious problem in northern and southern cities alike, but evidently it is most acute in the northern ones (see table 10). The eight highest ratios, all 14.0 or above, are found in Boston, Chicago, Cleveland, San Francisco, Cincinnati, New York, Newark, and Detroit, some of the largest northern industrial centers. However, this geographical differential in the ratios may, in part, be due to incompleteness in reporting tuberculosis as a cause of death in southern cities, in addition to real differences in tuberculosis mortality.

It was among the nonwhite population of the 92 cities that the relatively largest number of reductions in the death ratios were achieved between 1939–41 and 1942–43. Of the 39 ratios, only 5 increased and 2 showed no change, while 32, or 82 percent of the total, decreased.

RANKINGS OF TUBERCULOSIS DEATH RATIOS BY CITY POPULATION-SIZE GROUPS

There seems to be a variation in tuberculosis mortality with population size of city, although the reasons for it are not fully understood, and it is of interest, therefore, to note briefly the tuberculosis death ratios of cities of similar population size.

In table 4 are presented the tuberculosis death ratios by race for four city-size groups and for all cities for 1942–43 and 1939–41. There has been a general decrease in the total tuberculosis proportionate mortality for all 92 cities from 5.0 in 1939–41 to 4.6 in 1942–43 and, similarly, decreases have occurred in each of the race and city-size groups.

TABLE 4.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 92 cities of over 100,000 population, classified by population size of city, and by race: United States, 1942–43 and 1939–41*

[By place of residence]

Population size of city	All races		White [2]		Nonwhite [3]	
	1942–43	1939–41 [1]	1942–43	1939–41 [1]	1942–43	1939–41 [4]
All cities	4.6	5.0	3.7	3.9	11.9	12.9
1,000,000 or more	4.8	5.3	3.7	4.1	14.5	15.9
500,000 to 1,000,000	5.0	5.2	3.8	4.0	12.2	13.2
200,000 to 500,000	4.5	4.8	3.7	4.0	10.0	10.5
100,000 to 200,000	3.8	4.1	3.2	3.4	8.9	10.2

[1] Includes data for Sacramento, Calif., Camden, N. J., and Charlotte, N. C., for 1940–41 only.
[2] For cities having small nonwhite populations the data for all races are used.
[3] Based on data only for those cities in which the nonwhite population constitutes at least 10 percent of the total population or numbers 20,000 or more.
[4] Includes data for Camden, N. J., and Charlotte, N. C., for 1940–41 only.

The variation in the ratios for 1942–43 by size of city is not the same for each race group. For all races and whites the maximum ratio is found for the 500,000 to 1,000,000 population group while the minimum occurs in the smallest cities, the 100,000 to 200,000 groups. The death ratios for nonwhites, on the other hand, increase with population size from a minimum among cities of 100,000 to 200,000 to a maximum in cities of over 1,000,000.[7]

The individual cities ranked for each race and city size are given in tables 5 to 7.

TABLE 5.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 92 cities of over 100,000 population grouped according to population size of city: United States, 1942–43 (all races)*

[By place of residence]

Rank	City	Death ratio	Rank	City	Death ratio
	Cities of 100,000 to 200,000			*Cities of 200,000 to 500,000*	
1	Salt Lake City, Utah	1.4	1	Minneapolis, Minn	2.1
2	Des Moines, Iowa	1.7	2	Portland, Oreg	2.4
2	Spokane, Wash	1.7	2	Syracuse, N. Y	2.4
4	Grand Rapids, Mich	1.8	4	Omaha, Nebr	2.5
4	Long Beach, Calif	1.8	5	Rochester, N. Y	2.8
6	Duluth, Minn	2.0	6	St. Paul, Minn	3.0
7	Utica, N. Y	2.1	7	Akron, Ohio	3.4
8	Peoria, Ill	2.5	7	Providence, R. I	3.4
8	Wichita, Kans	2.5	9	Oakland, Calif	3.5
10	Somerville, Mass	2.6	9	Seattle, Wash	3.5
10	Springfield, Mass	2.6	11	Kansas City, Mo	3.7
12	Lowell, Mass	2.7	11	Oklahoma City, Okla	3.7
13	Elizabeth, N. J	2.8	11	San Diego, Calif	3.7
13	Flint, Mich	2.8	14	Denver, Colo	3.8
13	South Bend, Ind	2.8	15	Columbus, Ohio	4.0
16	New Haven, Conn	2.9	16	Indianapolis, Ind	4.2
16	Worcester, Mass	2.9	17	Louisville, Ky	4.6
18	Erie, Pa	3.1	18	Toledo, Ohio	4.9
18	Tacoma, Wash	3.1	19	Jersey City, N. J	5.0
20	New Bedford, Mass	3.2	19	Dayton, Ohio	5.0
21	Canton, Ohio	3.3	21	Dallas, Tex	5.1
21	Hartford, Conn	3.3	22	Cincinnati, Ohio	5.3
21	Wilmington, Del	3.3	23	Newark, N. J	5.5
24	Albany, N. Y	3.4	24	Houston, Tex	5.9
24	Bridgeport, Conn	3.4	24	New Orleans, La	5.9
24	Charlotte, N. C	3.4	26	Atlanta, Ga	6.3
24	Fort Wayne, Ind	3.4	27	Birmingham, Ala	6.4
24	Reading, Pa	3.4	28	Memphis, Tenn	6.5
29	Kansas City, Kans	3.5	29	San Antonio, Tex	9.9
30	Fall River, Mass	3.7			
31	Paterson, N. J	3.8		*Cities of 500,000 to 1,000,000*	
31	Scranton, Pa	3.8			
33	Cambridge, Mass	3.9	1	Milwaukee, Wis	3.8
34	Yonkers, N. Y	4.0	2	Pittsburgh, Pa	4.3
35	Fort Worth, Tex	4.1	3	St. Louis, Mo	4.4
36	Camden, N. J	4.2	3	San Francisco, Calif	4.4
37	Youngstown, Ohio	4.5	5	Buffalo, N. Y	4.5
38	Knoxville, Tenn	4.6	6	Boston, Mass	5.0
38	Tulsa, Okla	4.6	7	Cleveland, Ohio	5.2
40	Tampa, Fla	4.9	8	Baltimore, Md	6.3
41	Norfolk, Va	5.2	8	Washington, D. C	6.3
42	Trenton, N. J	5.5			
43	Miami, Fla	5.6		*Cities of 1,000,000 and over*	
43	Richmond, Va	5.6			
45	Nashville, Tenn	5.7	1	New York, N. Y	4.6
46	Gary, Ind	6.0	2	Los Angeles, Calif	4.7
47	Jacksonville, Fla	6.2	2	Philadelphia, Pa	4.7
48	Sacramento, Calif	7.2	4	Chicago, Ill	5.0
49	Chattanooga, Tenn	8.4	5	Detroit, Mich	5.9

[7] The same relationship was found by Liveright (*1*) for death rates in 1939–41.

TABLE 6.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 92 cities of over 100,000 population grouped according to population size of city: United States, 1942–43 (white)*[1]

[By place of residence]

Rank	City	Death ratio
	Cities of 100,000 to 200,000	
1	Salt Lake City, Utah	1.4
2	Des Moines, Iowa	1.7
2	Spokane, Wash	1.7
4	Grand Rapids, Mich	1.8
4	Long Beach, Calif	1.8
6	Duluth, Minn	2.0
7	Utica, N. Y	2.1
8	Norfolk, Va	2.2
8	Wilmington, Del	2.2
10	Charlotte, N. C	2.4
11	Peoria, Ill	2.5
11	Wichita, Kans	2.5
13	Somerville, Mass	2.6
13	Springfield, Mass	2.6
15	Lowell, Mass	2.7
16	Elizabeth, N. J	2.8
16	Flint, Mich	2.8
16	South Bend, Ind	2.8
19	Jacksonville, Fla	2.9
19	New Haven, Conn	2.9
19	Worcester, Mass	2.9
22	Erie, Pa	3.1
22	Tacoma, Wash	3.1
24	Camden, N. J	3.2
24	Kansas City, Kans	3.2
24	New Bedford, Mass	3.2
27	Canton, Ohio	3.3
27	Hartford, Conn	3.3
27	Miami, Fla	3.3
30	Albany, N. Y	3.4
30	Bridgeport, Conn	3.4
30	Fort Wayne, Ind	3.4
30	Reading, Pa	3.4
34	Fall River, Mass	3.7
34	Knoxville, Tenn	3.7
34	Tampa, Fla	3.7
37	Paterson, N. J	3.8
37	Scranton, Pa	3.8
37	Tulsa, Okla	3.8
40	Cambridge, Mass	3.9
40	Fort Worth, Tex	3.9
40	Gary, Ind	3.9
40	Nashville, Tenn	3.9
40	Richmond, Va	3.9
45	Yonkers, N. Y	4.0
46	Youngstown, Ohio	4.5
47	Chattanooga, Tenn	5.5
47	Trenton, N. J	5.5
49	Sacramento, Calif	7.2

Rank	City	Death ratio
	Cities of 200,000 to 500,000	
1	Minneapolis, Minn	2.1
2	Portland, Oreg	2.4
2	Syracuse, N. Y	2.4
4	Omaha, Nebr	2.5
5	Kansas City, Mo	2.7
6	Birmingham, Ala	2.8
6	Rochester, N. Y	2.8
8	Indianapolis, Ind	2.9
9	Columbus, Ohio	3.0
9	St. Paul, Minn	3.0
11	Akron, Ohio	3.4
12	Providence, R. I	3.4
13	Cincinnati, Ohio	3.5
13	Louisville, Ky	3.5
13	Memphis, Tenn	3.5
13	Oakland, Calif	3.5
13	Seattle, Wash	3.5
18	Atlanta, Ga	3.6
19	Newark, N. J	3.7
19	Oklahoma City, Okla	3.7
19	San Diego, Calif	3.7
22	Denver, Colo	3.8
23	Dallas, Tex	4.1
24	New Orleans, La	4.2
25	Houston, Tex	4.9
25	Toledo, Ohio	4.9
27	Dayton, Ohio	5.0
27	Jersey City, N. J	5.0
29	San Antonio, Tex	9.9
	Cities of 500,000 to 1,000,000	
1	Pittsburgh, Pa	3.1
2	Washington, D. C	3.2
3	St. Louis, Mo	3.3
4	Milwaukee, Wis	3.8
5	Cleveland, Ohio	3.9
5	San Francisco, Calif	3.9
7	Baltimore, Md	4.0
8	Buffalo, N. Y	4.5
9	Boston, Mass	4.6
	Cities of 1,000,000 and over	
1	Philadelphia, Pa	3.3
2	New York, N. Y	3.7
3	Chicago, Ill	3.8
4	Los Angeles, Calif	4.2
5	Detroit, Mich	4.3

[1] For cities having small nonwhite population the death ratios for all races are used.

TABLE 7.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 39* [1] *cities of over 100,000 population grouped according to population size of city: United States, 1942–43 (nonwhite)*

[By place of residence]

Rank	City	Death ratio
	Cities of 100,000 to 200,000	
1	Kansas City, Kans.	4.5
2	Charlotte, N. C.	4.6
3	Fort Worth, Tex.	4.9
4	Tampa, Fla.	7.7
5	Wilmington, Del.	8.1
6	Richmond, Va.	8.2
7	Knoxville, Tenn.	8.3
8	Nashville, Tenn.	8.6
9	Tulsa, Okla.	9.0
10	Norfolk, Va.	9.2
11	Camden, N. J.	9.9
12	Jacksonville, Fla.	10.1
13	Gary, Ind.	11.2
14	Chattanooga, Tenn.	12.3
15	Miami, Fla.	12.9
	Cities of 200,000 to 500,000	
1	Dallas, Tex.	8.4
2	Houston, Tex.	8.5
2	Louisville, Ky.	8.5
4	Kansas City, Mo.	8.9
5	New Orleans, La.	9.0
6	Atlanta, Ga.	9.4
	Cities of 200,000 to 500,000—Con.	
7	Memphis, Tenn.	9.6
8	Birmingham, Ala.	9.7
9	Columbus, Ohio	9.9
10	Indianapolis, Ind.	10.2
11	Cincinnati, Ohio	15.4
12	Newark, N. J.	16.2
	Cities of 500,000 to 1,000,000	
1	St. Louis, Mo.	9.5
2	Washington, D. C.	11.6
3	Pittsburgh, Pa.	12.4
4	Baltimore, Md.	12.9
5	Boston, Mass.	14.0
6	Cleveland, Ohio	14.6
7	San Francisco, Calif.	15.0
	Cities of 1,000,000 and over	
1	Los Angeles, Calif.	12.6
1	Philadelphia, Pa.	12.6
3	Chicago, Ill.	14.1
4	New York, N. Y.	16.0
5	Detroit, Mich.	16.4

[1] Cities in this table are those in which the nonwhite population constitutes at least 10 percent of the total population or numbers 20,000 or more according to the 1940 Census.

RANKINGS OF THE TUBERCULOSIS DEATH RATIOS BY GEOGRAPHIC DIVISIONS

To facilitate comparisons between cities of comparable geographical location, the country was divided into four regions, Northeast, South, Middle West, and Far West,[8] and the cities within each region ranked for each race group (tables 8–10).

TABLE 8.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 92 cities of over 100,000 population by geographic regions: United States, 1942–43 (all races)*

[By place of residence]

Rank	City	Death ratio
	Northeast	
1	Utica, N. Y.	2.1
2	Syracuse, N. Y.	2.4
3	Somerville, Mass.	2.6
3	Springfield, Mass.	2.6
5	Lowell, Mass.	2.7
6	Elizabeth, N. J.	2.8
6	Rochester, N. Y.	2.8
8	New Haven, Conn.	2.9
8	Worchester, Mass.	2.9
10	Erie, Pa.	3.1
11	New Bedford, Mass.	3.2
12	Hartford, Conn.	3.3
13	Albany, N. Y.	3.4
13	Bridgeport, Conn.	3.4
13	Providence, R. I.	3.4
13	Reading, Pa.	3.4
17	Fall River, Mass.	3.7
18	Paterson, N. J.	3.8
18	Scranton, Pa.	3.8
20	Cambridge, Mass.	3.9
21	Yonkers, N. Y.	4.0
22	Camden, N. J.	4.2
23	Pittsburgh, Pa.	4.3
24	Buffalo, N. Y.	4.5
25	New York, N. Y.	4.6
26	Philadelphia, Pa.	4.7
27	Boston, Mass.	5.0
27	Jersey City, N. J.	5.0
29	Newark, N. J.	5.5
29	Trenton, N. J.	5.5
	Middle West	
1	Des Moines, Iowa	1.7
2	Grand Rapids, Mich.	1.8
3	Duluth, Minn.	2.0
4	Minneapolis, Minn.	2.1
5	Omaha, Nebr.	2.5
5	Peoria, Ill.	2.5
5	Wichita, Kans.	2.5
8	Flint, Mich.	2.8
8	South Bend, Ind.	2.8
10	St. Paul, Minn.	3.0
11	Canton, Ohio	3.3
12	Akron, Ohio	3.4
12	Fort Wayne, Ind.	3.4
14	Kansas City, Kans.	3.5
15	Kansas City, Mo.	3.7
16	Milwaukee, Wis.	3.8
17	Columbus, Ohio	4.0
18	Indianapolis, Ind.	4.2
	Middle West—Continued	
19	St. Louis, Mo.	4.4
20	Youngstown, Ohio	4.5
21	Toledo, Ohio	4.9
22	Chicago, Ill.	5.0
22	Dayton, Ohio	5.0
24	Cleveland, Ohio	5.2
25	Cincinnati, Ohio	5.3
26	Detroit, Mich.	5.9
27	Gary, Ind.	6.0
	South	
1	Wilmington, Del.	3.3
2	Charlotte, N. C.	3.4
3	Oklahoma City, Okla.	3.7
4	Fort Worth, Tex.	4.1
5	Knoxville, Tenn.	4.6
5	Louisville, Ky.	4.6
5	Tulsa, Okla.	4.6
8	Tampa, Fla.	4.9
9	Dallas, Tex.	5.1
10	Norfolk, Va.	5.2
11	Miami, Fla.	5.6
11	Richmond, Va.	5.6
13	Nashville, Tenn.	5.7
14	Houston, Tex.	5.9
14	New Orleans, La.	5.9
16	Jacksonville, Fla.	6.2
17	Atlanta, Ga.	6.3
17	Baltimore, Md.	6.3
17	Washington, D. C.	6.3
20	Birmingham, Ala.	6.4
21	Memphis, Tenn.	6.5
22	Chattanooga, Tenn.	8.4
23	San Antonio, Tex.	9.9
	Far West	
1	Salt Lake City, Utah	1.4
2	Spokane, Wash.	1.7
3	Long Beach, Calif.	1.8
4	Portland, Oreg.	2.4
5	Tacoma, Wash.	3.1
6	Oakland, Calif.	3.5
6	Seattle, Wash.	3.5
8	San Diego, Calif.	3.7
9	Denver, Colo.	3.8
10	San Francisco, Calif.	4.4
11	Los Angeles, Calif.	4.7
12	Sacramento, Calif.	7.2

[8] These regions were formed by combination of the geographic divisions used by the Bureau of the Census as follows:

Northeast: New England, and Middle Atlantic States;
South: South Atlantic, East South Central, and West South Central States;
Middle West: East North Central and West North Central States;
Far West: Mountain and Pacific States.

TABLE 9.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 92 cities of over 100,000 population by geographic regions: United States, 1942–43 (white)* [1]

[By place of residence]

Rank	City	Death ratio
	Northeast	
1	Utica, N. Y.	2.1
2	Syracuse, N. Y.	2.4
3	Somerville, Mass.	2.6
3	Springfield, Mass.	2.6
5	Lowell, Mass.	2.7
6	Elizabeth, N. J.	2.8
6	Rochester, N. Y.	2.8
8	New Haven, Conn.	2.9
8	Worcester, Mass.	2.9
10	Erie, Pa.	3.1
10	Pittsburgh, Pa.	3.1
12	Camden, N. J.	3.2
12	New Bedford, Mass.	3.2
14	Hartford, Conn.	3.3
14	Philadelphia, Pa.	3.3
16	Albany, N. Y.	3.4
16	Bridgeport, Conn.	3.4
16	Providence, R. I.	3.4
16	Reading, Pa.	3.4
20	Fall River, Mass.	3.7
20	Newark, N. J.	3.7
20	New York, N. Y.	3.7
23	Paterson, N. J.	3.8
23	Scranton, Pa.	3.8
25	Cambridge, Mass.	3.9
26	Yonkers, N. Y.	4.0
27	Buffalo, N. Y.	4.5
28	Boston, Mass.	4.6
29	Jersey City, N. J.	5.0
30	Trenton, N. J.	5.5
	Middle West	
1	Des Moines, Iowa.	1.7
2	Grand Rapids, Mich.	1.8
3	Duluth, Minn.	2.0
4	Minneapolis, Minn.	2.1
5	Omaha, Nebr.	2.5
5	Peoria, Ill.	2.5
5	Wichita, Kans.	2.5
8	Kansas City, Mo.	2.7
9	Flint, Mich.	2.8
9	South Bend, Ind.	2.8
11	Indianapolis, Ind.	2.9
12	Columbus, Ohio.	3.0
12	St. Paul, Minn.	3.0
14	Kansas City, Kans.	3.2
15	Canton, Ohio.	3.3
15	St. Louis, Mo.	3.3
17	Akron, Ohio.	3.4
	Middle West—Continued	
17	Fort Wayne, Ind.	3.4
19	Cincinnati, Ohio.	3.5
20	Chicago, Ill.	3.8
20	Milwaukee, Wis.	3.8
22	Cleveland, Ohio.	3.9
22	Gary, Ind.	3.9
24	Detroit, Mich.	4.3
25	Youngstown, Ohio.	4.5
26	Toledo, Ohio.	4.9
27	Dayton, Ohio.	5.0
	South	
1	Norfolk, Va.	2.2
1	Wilmington, Del.	2.2
3	Charlotte, N. C.	2.4
4	Birmingham, Ala.	2.8
5	Jacksonville, Fla.	2.9
6	Washington, D. C.	3.2
7	Miami, Fla.	3.3
8	Louisville, Ky.	3.5
8	Memphis, Tenn.	3.5
10	Atlanta, Ga.	3.6
11	Knoxville, Tenn.	3.7
11	Oklahoma City, Okla.	3.7
11	Tampa, Fla.	3.7
14	Tulsa, Okla.	3.8
15	Fort Worth, Tex.	3.9
15	Nashville, Tenn.	3.9
15	Richmond, Va.	3.9
18	Baltimore, Md.	4.0
19	Dallas, Tex.	4.1
20	New Orleans, La.	4.2
21	Houston, Tex.	4.9
22	Chattanooga, Tenn.	5.5
23	San Antonio, Tex.	9.9
	Far West	
1	Salt Lake City, Utah.	1.4
2	Spokane, Wash.	1.7
3	Long Beach, Calif.	1.8
4	Portland, Oreg.	2.4
5	Tacoma, Wash.	3.1
6	Oakland, Calif.	3.5
6	Seattle, Wash.	3.5
8	San Diego, Calif.	3.7
9	Denver, Colo.	3.8
10	San Francisco, Calif.	3.9
11	Los Angeles, Calif.	4.2
12	Sacramento, Calif.	7.2

[1] For cities having small nonwhite populations the death ratios for all races are used.

TABLE 10.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes for the 39* [1] *cities of over 100,000 population by geographic regions: United States, 1942–43 (nonwhite)*

[By place of residence]

Rank	City	Death ratio
	Northeast	
1	Camden, N. J	9.9
2	Pittsburgh, Pa	12.4
3	Philadelphia, Pa	12.6
4	Boston, Mass	14.0
5	New York, N. Y	16.0
6	Newark, N. J	16.2
	Middle West	
1	Kansas City, Kans	4.5
2	Kansas City, Mo	8.9
3	St. Louis, Mo	9.5
4	Columbus, Ohio	9.9
5	Indianapolis, Ind	10.2
6	Gary, Ind	11.2
7	Chicago, Ill	14.1
8	Cleveland, Ohio	14.6
9	Cincinnati, Ohio	15.4
10	Detroit, Mich	16.4
	South	
1	Charlotte, N. C	4.6
2	Fort Worth, Tex	4.9
	South—Continued	
3	Tampa, Fla	7.7
4	Wilmington, Del	8.1
5	Richmond, Va	8.2
6	Knoxville, Tenn	8.3
7	Dallas, Tex	8.4
8	Houston, Tex	8.5
8	Louisville, Ky	8.5
10	Nashville, Tenn	8.6
11	New Orleans, La	9.0
11	Tulsa, Okla	9.0
13	Norfolk, Va	9.2
14	Atlanta, Ga	9.4
15	Memphis, Tenn	9.6
16	Birmingham, Ala	9.7
17	Jacksonville, Fla	10.1
18	Washington, D. C	11.6
19	Chattanooga, Tenn	12.3
20	Baltimore, Md	12.9
20	Miami, Fla	12.9
	Far West	
1	Los Angeles, Calif	12.6
2	San Francisco, Calif	15.0

[1] Cities in this table are those in which the nonwhite population constitutes at least 10 percent of the total population or numbers 20,000 or more according to the 1940 Census.

TABLE 11.—*Alphabetical listing of the 92 cities of 100,000 or more population with their respective ranking numbers as found in tables 1–10*

No.	City	Population-size group (1940 census) by 100,000's	Geographic region	Rank among 92 cities [1]			Rank within its population-size group [1]			Rank within its geographic region [1]		
				All races	White	Nonwhite	All races	White	Nonwhite	All races	White	Nonwhite
1	Akron, Ohio	2–5	Middle West	30	44	----	7	11	----	12	17	----
2	Albany, N. Y	1–2	Northeast	30	44	----	24	30	----	13	16	----
3	Atlanta, Ga	2–5	South	85	55	16	26	18	6	17	10	14
4	Baltimore, Md	5–10	South	85	76	30	8	7	4	17	18	20
5	Birmingham, Ala	2–5	South	88	21	19	27	6	8	20	4	16
6	Boston, Mass	5–10	Northeast	67	84	32	6	9	5	27	28	4
7	Bridgeport, Conn	1–2	Northeast	30	44	----	24	30	---	13	16	----
8	Buffalo, N. Y	5–10	Northeast	57	82	----	5	8	----	24	27	----
9	Cambridge, Mass	1–2	Northeast	48	69	----	33	40	---	20	25	----
10	Camden, N. J	1–2	Northeast	52	35	20	36	24	11	22	12	1
11	Canton, Ohio	1–2	Middle West	27	39	----	21	27	----	11	15	----
12	Charlotte, N. C	1–2	South	30	11	2	24	10	2	2	3	1
13	Chattanooga, Tenn	1–2	South	91	89	26	49	47	14	22	22	19
14	Chicago, Ill	10 and over	Middle West	67	63	33	4	3	3	22	20	7
15	Cincinnati, Ohio	2–5	Middle West	74	50	36	22	13	11	25	19	9
16	Cleveland, Ohio	5–10	Middle West	72	69	34	7	5	6	24	22	8
17	Columbus, Ohio	2–5	Middle West	49	30	20	15	9	9	17	12	4
18	Dallas, Tex	2–5	South	71	78	8	21	23	1	9	19	7
19	Dayton, Ohio	2–5	Middle West	67	87	----	19	27	----	22	27	----
20	Denver, Colo	2–5	Far West	44	63	----	14	22	----	9	9	--
21	Des Moines, Iowa	1–2	Middle West	2	2	----	2	2	----	1	1	--
22	Detroit, Mich	10 and over	Middle West	80	81	39	5	5	5	26	24	10
23	Duluth, Minn	1–2	Middle West	6	6	----	6	6	----	3	3	----
24	Elizabeth, N. J	1–2	Northeast	17	21	----	13	16	----	6	6	----
25	Erie, Pa	1–2	Northeast	24	32	----	18	22	----	10	10	----
26	Fall River, Mass	1–2	Northeast	40	56	----	30	34	----	17	20	---
27	Flint, Mich	1–2	Middle West	17	21	----	13	16	----	8	9	----
28	Fort Wayne, Ind	1–2	Middle West	30	44	----	24	30	----	12	17	----
29	Fort Worth, Tex	1–2	South	51	69	3	35	40	3	4	15	2
30	Gary, Ind	1–2	Middle West	83	69	24	46	40	13	27	22	6
31	Grand Rapids, Mich	1–2	Middle West	4	4	----	4	4	----	2	2	----
32	Hartford, Conn	1–2	Northeast	27	39	----	21	27	----	12	14	----
33	Houston, Tex	2–5	South	80	85	9	24	25	2	14	21	8
34	Indianapolis, Ind	2–5	Middle West	52	26	23	16	8	10	18	11	5
35	Jacksonville, Fla	1–2	South	84	26	22	47	19	12	16	5	17

See footnote at end of table.

TABLE 11.—*Alphabetical listing of the 92 cities of 100,000 or more population with their respective ranking numbers as found in tables 1–10*—Continued

No.	City	Population-size group (1940 census) by 100,000's	Geographic region	Rank among 92 cities[1]			Rank within its population-size group[1]			Rank within its geographic region[1]		
				All races	White	Nonwhite	All races	White	Nonwhite	All races	White	Nonwhite
36	Jersey City, N. J.	2–5	Northeast	67	87	----	19	27	----	27	29	----
37	Kansas City, Kans.	1–2	Middle West	37	35	1	29	24	1	14	14	1
38	Kansas City, Mo.	2–5	Middle West	40	19	12	11	5	4	15	8	2
39	Knoxville, Tenn.	1–2	South	59	56	7	38	34	7	5	11	6
40	Long Beach, Calif.	1–2	Far West	4	4	----	4	4	----	3	3	----
41	Los Angeles, Calif.	10 and over	Far West	63	79	28	2	4	1	11	11	1
42	Louisville, Ky.	2–5	South	59	50	9	17	13	2	5	8	8
43	Lowell, Mass.	1–2	Northeast	16	19	----	12	15	----	5	5	----
44	Memphis, Tenn.	2–5	South	89	50	18	28	13	7	21	8	15
45	Miami, Fla.	1–2	South	77	39	30	43	27	15	11	7	20
46	Milwaukee, Wis.	5–10	Middle West	44	63	----	1	4	----	16	20	----
47	Minneapolis, Minn.	2–5	Middle West	7	7	----	1	1	----	4	4	----
48	Nashville, Tenn.	1–2	South	79	69	11	45	40	8	13	15	10
49	Newark, N. J.	2–5	Northeast	75	56	38	23	19	12	29	20	6
50	New Bedford, Mass.	1–2	Northeast	26	35	----	20	24	----	11	12	----
51	New Haven, Conn.	1–2	Northeast	21	26	----	16	19	----	8	8	----
52	New Orleans, La.	2–5	South	80	79	13	24	24	5	14	20	11
53	New York, N. Y.	10 and over	Northeast	59	56	37	1	2	4	25	20	5
54	Norfolk, Va.	1–2	South	72	9	15	41	8	10	10	1	13
55	Oakland, Calif.	2–5	Far West	37	50	----	9	13	----	6	6	----
56	Oklahoma City, Okla.	2–5	South	40	56	----	11	19	----	3	11	----
57	Omaha, Nebr.	2–5	Middle West	11	14	----	4	4	----	5	5	----
58	Paterson, N. J.	1–2	Northeast	44	63	----	31	37	----	18	23	----
59	Peoria, Ill.	1–2	Middle West	11	14	----	8	11	----	5	5	----
60	Philadelphia, Pa.	10 and over	Northeast	63	39	28	2	1	1	26	14	3
61	Pittsburgh, Pa.	5–10	Northeast	54	32	27	2	1	3	23	10	2
62	Portland, Oreg.	2–5	Far West	9	11	----	2	2	----	4	4	----
63	Providence, R. I.	2–5	Northeast	30	44	----	7	12	----	13	16	----
64	Reading, Pa.	1–2	Northeast	30	44	----	24	30	----	13	16	----
65	Richmond, Va.	1–2	South	77	69	6	43	40	6	11	15	5
66	Rochester, N. Y.	2–5	Northeast	17	21	----	5	6	----	6	6	----
67	Sacramento, Calif.	1–2	Far West	90	91	----	48	49	----	12	12	----
68	St. Louis, Mo.	5–10	Middle West	55	39	17	3	3	1	19	15	3
69	St. Paul, Minn.	2–5	Middle West	23	30	----	6	9	----	10	12	----
70	Salt Lake City, Utah	1–2	Far West	1	1	----	1	1	----	1	1	----
71	San Antonio, Tex.	2–5	South	92	92	----	29	29	----	23	23	----
72	San Diego, Calif.	2–5	Far West	40	56	----	11	19	----	8	8	----
73	San Francisco, Calif.	5–10	Far West	55	69	35	3	5	7	10	10	2
74	Scranton, Pa.	1–2	Northeast	44	63	----	31	37	----	18	23	----
75	Seattle, Wash.	2–5	Far West	37	50	----	9	13	----	6	6	----
76	Somerville, Mass.	1–2	Northeast	14	17	----	10	13	----	3	3	----
77	South Bend, Ind.	1–2	Middle West	17	21	----	13	16	----	8	9	----
78	Spokane, Wash.	1–2	Far West	2	2	----	2	2	----	2	2	----
79	Springfield, Mass.	1–2	Northeast	14	17	----	10	13	----	3	3	----
80	Syracuse, N. Y.	2–5	Northeast	9	11	----	2	2	----	2	2	----
81	Tacoma, Wash.	1–2	Far West	24	32	----	18	22	----	5	5	----
82	Tampa, Fla.	1–2	South	65	56	4	40	34	4	8	11	3
83	Toledo, Ohio	2–5	Middle West	65	85	----	18	25	----	21	26	----
84	Trenton, N. J.	1–2	Northeast	75	89	----	42	47	----	29	30	----
85	Tulsa, Okla.	1–2	South	59	63	13	38	37	9	5	14	11
86	Utica, N. Y.	1–2	Northeast	7	7	----	7	7	----	1	1	----
87	Washington, D. C.	5–10	South	85	35	25	8	2	2	17	6	18
88	Wichita, Kans.	1–2	Middle West	11	14	----	8	11	----	5	5	----
89	Wilmington, Del.	1–2	South	27	9	5	21	8	5	1	1	4
90	Worcester, Mass.	1–2	Northeast	21	26	----	16	19	----	8	8	----
91	Yonkers, N. Y.	1–2	Northeast	49	76	----	34	45	----	21	26	----
92	Youngstown, Ohio	1–2	Middle West	57	82	----	37	46	----	20	25	----

[1] The cities are distributed according to population groups and geographic regions as follows:

Race group	Population group				Geographic region				Total
	100,000–200,000	200,000–500,000	500,000–1,000,000	1,000,000 and over	Northeast	Middle West	South	Far West	
White and all races	49	29	9	5	30	27	23	12	92
Nonwhite	15	12	7	5	6	10	21	2	39

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CHARACTERISTICS OF COMMERCIAL X-RAY INTENSIFYING SCREENS

RESOLVING POWER

Resolving power constitutes a measure of the ability of X-ray films and screens to record detail and is determined by radiographing, under standard conditions, a graduated series of linear patterns on the film or screen under test. It is expressed as the maximum number of lines per millimeter that can be distinguished on the processed film. The resolving powers of intensifying screens are considerably less than those of films, and therefore measurements of film-screen combinations are essentially the resolving powers of the screens alone. Screens with the highest resolving power are capable of recording the greatest detail.

Resolving power of commercial screens

Manufacturer	Type	Resolving power (lines per mm.)	Use	Note
Buck	Xtra speed	10	Intensifying	1 thick and 1 thin screen.
	Xtra speed	10	Intensifying	2 medium screens.
	Midspeed	12½	Intensifying	
	Definition	12½	Intensifying	
Eastman	Ultra speed	9	Intensifying	
	Fine grain	10	Intensifying	
	Definition	10	Intensifying	
Patterson	Parspeed	10	Intensifying	
	Detail	17½	Intensifying	
	Type D	[1] 7	Fluorographic	Regular.
	Type D	[1] 7	Fluorographic	Cleanable.
	Type B	[1] 6	Fluorographic and Fluoroscopic	Regular.
	Type B	[1] 6	Fluorographic and Fluoroscopic	Cleanable.

[1] These figures apply only to the fluorescent screens themselves. When used in photofluorography, the additional effect of the lens and film reduces resolving power to approximately one-third of these values in 70-mm. film and to one-fifth of these values in 35-mm. film.

Each month on this page these and other additional quantitative data on the characteristics of X-ray materials will be reported for the benefit of physicians and X-ray technicians. This represents the first systematic attempt to provide such information. In forthcoming months it is planned to include data on speed, contrast, and unsharpness of commercially available films and screens. These reports are from the Laboratory of the Radiology Section, Tuberculosis Control Division, United States Public Health Service.

Excerpt From

TUBERCULOSIS IN HOLLAND DURING THE WAR[1]

"When in September, 1939, war was declared between England and Germany (Holland became involved only in May, 1940) we feared that an increase of tuberculosis was to be expected, as happened during the Great War 1914–1918; then Holland remained neutral, but a large increase in the tuberculosis death-rate was already apparent in 1914.

"Before World War I, in 1913, the death-rate from tuberculosis in the Netherlands was 142.0 per 100,000 inhabitants for all forms and 106.4 for pulmonary tuberculosis. For Holland these figures showed an increase in 1918 up to 202.5 for all forms, and to 158.6 for pulmonary tuberculosis. Therefore there was an increase for the Netherlands of 49 per cent for all forms of tuberculosis and of 55 per cent for pulmonary tuberculosis. In England at the time the tuberculosis death-rate increased 17 per cent, and in Germany there was an increase of 62 per cent. . . .

"Such being our experience, it is to be understood that in 1939 we were very anxious about the future. Properly speaking an increase was expected before 1939 during the economic crisis, a period which brought social distress in Holland and to a great part of her inhabitants. Notwithstanding these sombre forebodings, however, there was no increase, but a notable decrease during the decade 1930–1939; for instance, in Amsterdam in 1939 the death-rate from all forms of tuberculosis was 35.2 and from pulmonary tuberculosis 25.2 per 100,000 inhabitants, i. e., 50 per cent of the death-rates in 1930. . . .

"In 1940 an increase was shown, although we were four months without war, and this increase has grown rapidly and steadily each year. In 1939 the death-rate in Holland was 41.0 for all forms and 28.3 for pulmonary tuberculosis per 100,000 inhabitants. The corresponding figures for Amsterdam were considerably lower, 35.2

[1] Van Den Berg, Heynsius: Tuberculosis in Holland during the war. Tubercle (London): 181-185 (November-December 1945).

and 25.2 respectively; like those for Great Britain they were among the lowest of the world. But from 1940 there is an increase for the Netherlands up 70.0 and 50.4 in 1943, and for Amsterdam up to 82.7 and 63.0 in 1944. For the year 1944 a death-rate for the Netherlands cannot be given. In that year one-half of Holland was liberated, the other half remaining under German occupation, consequently the statistics are not complete, since there were no means of communication between the two parts of the country. The figures for Amsterdam are given approximately, as the population can be estimated only because neither the number of Jews deported, nor the part of the male population [sent] to Germany, nor the number of those taken as prisoners are known yet.

134% RISE IN AMSTERDAM

"In the Netherlands in 1943 the rise was for all forms of tuberculosis 70 per cent, for the pulmonary tuberculosis 77 per cent, considerably higher therefore than in 1918, when it was 49 per cent and 55 per cent respectively. The rise in Amsterdam is still more serious; it is now 134 per cent for all forms of tuberculosis and 150 per cent for pulmonary tuberculosis. This means that the mortality from pulmonary tuberculosis in Amsterdam in 1944 has reached a height of two and a half times as large as that of 1939, an increase in a period of only five years, which far surpasses the alarming rise during the World War I in Germany and Austria.

"The only favourable aspect is, that the increase took place when the tuberculosis death-rate was very low. Owing to this, although the increase in Amsterdam was twice as high as in the former war, the number of deaths from tuberculosis was much lower in this war.

"Tuberculosis death-rates by ages and sex in Holland are not available, for the present age-composition of our population cannot be accurately calculated as the last census dates from fifteen years back. For many decades the death-rate from pulmonary tuberculosis in Amsterdam has been higher among the male inhabitants than among the female, whereas in the rest of the country it was just the opposite; there the death-rate from pulmonary tuberculosis for women always exceeded that for men. Since the war a modification has taken place in so far that in the rest of Holland also the death-rate from pulmonary tuberculosis for men now exceeds that for women. As yet I cannot give a satisfactory explanation of this feature. It has been noticed, however, that on the whole men have withstood the want of food far less well than women and that they lost more weight. This smaller resistance of the men seems to have been noticed also in the concentration camps in Germany."

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Public Health Reports

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Printed With the Approval of the Bureau of the Budget as Required by Rule 42 of the Joint Committee on Printing

ANNOUNCEMENT

STATE AND TERRITORIAL HEALTH OFFICERS' CONFERENCE

The forty-fourth annual conference of State and Territorial health officers with the United States Public Health Service will be held April 8, 9, 10, and 11 in the Public Health Service building, Nineteenth Street and Constitution Avenue, Washington, D. C. All State and Territorial health authorities are urged to attend. General sessions are open to all interested persons.

THE INCIDENCE OF POLIOMYELITIS AND ITS CRIPPLING EFFECTS, AS RECORDED IN FAMILY SURVEYS [1]

By SELWYN D. COLLINS,[2] *Head Statistician, United States Public Health Service*

CONTENTS

The most dreaded diseases are not those with the greatest frequency. Diseases, like other situations, lose their awe-inspiring character when they become familiar. The spectacular affections that occur rarely but attack quickly and severely are the most feared. Poliomyelitis has several characteristics that make it a dreaded malady. Its exact method of transmission is unknown but it strikes swiftly and has a long duration of severe and painful symptoms with frequent residual crippling which may last throughout life.

[1] From the Division of Public Health Methods.

[2] The author is indebted to Dr. Mary Gover for assistance in the preparation of this paper.

More than 19,000 cases of poliomyelitis were reported in the United States in 1944 and nearly 14,000 in 1945. The 1944 total was considerably above that of any preceding year except 1916 when 29,000 cases were reported, of which 23,000 occurred in the 9 Northeastern States (*8*). The reported incidence in 1944 was 14 cases per 100,000 population, as compared with rates in 1916 of 28 for the country as a whole and 79 for the Northeast. But the 1916 epidemic was more severe than is indicated by these comparisons, since most of the cases were paralytic and the fatality was far greater than in 1944.

GEOGRAPHIC DISTRIBUTION, 1930 TO 1945

The monthly incidence of poliomyelitis as reported to health departments during the past 15 years is shown in figure 1 for the total United States and nine geographic sections (*12*). Considering first the case rates for the whole country (top of chart) it appears that epidemics occur nearly every year with an occasional one with exceptionally high rates. The high years stand out as 1931, 1935, 1937, 1940, 1943, and 1944. The 2 latter years had higher case rates than 1930 and 1931 when a similar 2-year wave of poliomyelitis spread over the country.

The incidence for the country as a whole is a composite of what has occurred in the various geographic sections during this 15-year period. Each region may be considered separately. The pictures for the New England and Middle Atlantic sections are reasonably similar. The only marked differences are that (*a*) in 1932 little poliomyelitis was reported in New England but there was a considerable amount in the Middle Atlantic States, and (*b*) the New England peak was slightly higher in 1943 than in 1944 but there was not much poliomyelitis in the Middle Atlantic region in 1943, the large epidemic in that section coming in 1944. The peaks in the East and West North Central sections are remarkably similar in chronology and size, although the East North Central is more urban than the West North Central. This similarity does not extend to the South; the East and West South Central curves are rather different, and the South Atlantic is different from both South Central sections and also from the Middle Atlantic. With the exception of a moderate peak in the West South Central region in 1930, not much poliomyelitis was reported in any of the three southern sections prior to 1935 when the South Atlantic and the East South Central regions had fairly high rates. Since that time these southern sections have had some rather large epidemics. The Mountain and Pacific regions are similar in the chronology of the epidemics but not in the heights of the peaks.

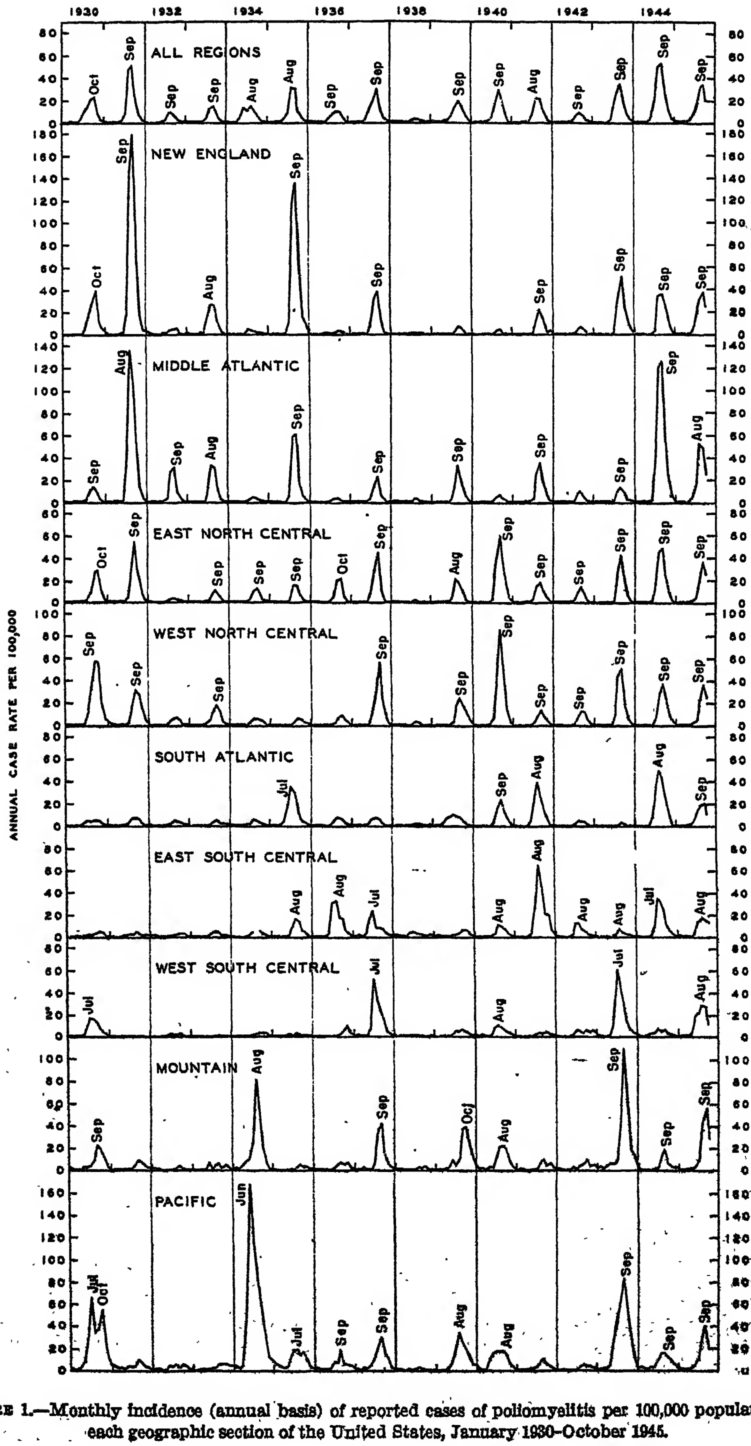

FIGURE 1.—Monthly incidence (annual basis) of reported cases of poliomyelitis per 100,000 population in each geographic section of the United States, January 1930–October 1945.

TABLE 1.—*Reported case and registered death[1] rates from poliomyelitis, by geographic[2] sections of the United States, 1930–44*

Calendar year	All sections		New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central[3]	Mountain	Pacific
	Number	Annual reported case rate per 100,000 population									
Average[4] 1930–44	8,662	6.71	8.55	8.04	6.26	7.05	4.57	4.88	3.96	7.01	11.64
1930	9,246	7.51	9.84	3.69	7.40	15.97	2.61	2.11	5.59	6.76	23.26
1931	15,921	12.84	37.20	28.42	11.20	9.12	2.64	1.93	.90	3.31	4.71
1932	3,811	3.05	2.35	6.73	1.88	2.32	2.06	1.75	1.24	1.64	3.51
1933	5,062	4.03	7.09	7.53	3.00	4.92	1.84	2.01	.92	2.77	3.48
1934	7,527	5.96	1.62	1.55	3.66	2.56	2.12	2.67	1.71	17.92	48.23
1935	10,839	8.52	29.31	13.30	4.11	2.19	10.04	4.84	1.76	2.25	10.55
1936	4,523	3.53	1.50	1.29	4.94	2.73	2.78	9.64	2.26	3.21	5.63
1937	9,511	7.38	7.97	4.15	8.32	11.15	3.09	6.58	12.43	9.87	9.11
1938	1,705	1.31	.90	.87	1.05	1.26	1.75	2.32	1.39	1.64	1.60
1939	7,343	5.61	1.81	6.24	5.33	7.00	5.07	2.58	2.82	12.11	11.40
1940	9,826	7.45	1.21	1.59	13.66	17.42	6.06	3.40	3.84	8.68	9.94
1941	9,086	6.83	5.19	8.01	5.02	3.82	10.51	16.45	2.37	3.59	3.94
1942	4,033	3.01	2.11	2.45	3.50	4.05	1.97	4.02	3.62	3.95	2.37
1943	12,449	9.29	10.42	3.34	8.51	11.50	1.27	2.29	14.87	22.57	29.51
1944	19,029	14.37	9.71	31.48	12.35	9.70	14.73	10.62	3.70	4.89	7.66
		Annual death rate per million population									
Average[4] 1930–44	1,017	7.9	6.6	7.6	6.7	9.1	6.4	9.1	10.0	10.4	9.5
1930	1,412	11.5	11.8	7.3	10.4	18.7	7.3	8.6	14.4	15.9	21.3
1931	2,102	16.9	30.8	34.2	12.9	11.9	8.3	9.3	9.0	12.0	8.6
1932	854	6.8	4.4	9.5	4.4	5.7	6.7	7.9	9.1	8.0	5.0
1933	812	6.5	6.3	8.2	4.2	7.7	5.0	8.1	8.9	4.7	4.0
1934	859	6.8	2.1	3.0	5.1	5.9	6.0	10.9	8.2	16.5	19.9
1935	987	7.8	16.1	7.6	4.3	4.4	10.4	8.4	7.1	8.0	10.8
1936	741	5.8	1.8	1.7	6.5	4.3	6.1	13.3	8.7	9.7	7.1
1937	1,433	11.1	6.3	4.7	10.0	18.8	6.7	13.1	25.1	19.1	10.1
1938	478	3.7	1.9	1.8	2.2	3.5	4.4	8.2	7.3	6.0	2.8
1939	756	5.8	1.2	4.5	3.6	9.1	5.3	7.4	8.1	9.8	9.2
1940	1,004	7.6	1.5	1.9	11.4	14.5	7.2	7.4	7.3	9.9	9.7
1941	826	6.2	2.4	4.8	4.4	5.9	7.4	15.2	8.6	5.1	3.9
1942	534	4.0	1.8	2.7	3.4	6.1	2.6	7.7	6.3	4.8	3.4
1943	1,115	8.3	6.3	2.5	8.8	12.1	2.2	3.5	16.3	19.7	18.7
1944	1,353	10.1	5.0	19.1	8.5	7.7	10.4	7.8	6.0	6.5	7.6
		Reported cases per death									
Average[4] 1930–44		8.5	13.0	10.6	9.3	7.7	7.1	5.4	4.0	6.7	12.3
1930		6.5	8.4	5.1	7.1	8.5	3.6	2.5	3.9	4.3	10.9
1931		7.6	12.1	8.3	8.7	7.7	3.2	2.1	1.0	2.8	5.5
1932		4.5	5.3	7.1	4.2	4.1	3.1	2.2	1.4	2.1	7.0
1933		6.2	11.2	9.1	7.1	6.4	3.7	2.5	1.0	5.8	8.7
1934		8.8	7.9	5.1	7.2	4.4	3.5	2.4	2.1	10.9	24.2
1935		11.0	18.2	17.6	9.7	5.0	9.7	5.8	2.5	2.8	9.7
1936		6.1	8.4	7.7	7.6	6.3	4.5	7.3	2.6	3.3	7.9
1937		6.6	12.7	8.9	8.4	5.9	4.6	5.0	5.0	5.2	9.0
1938		3.6	4.8	4.9	4.7	3.6	4.0	2.8	1.9	2.8	5.8
1939		9.7	15.3	13.9	15.0	7.7	9.5	3.5	3.5	12.4	12.4
1940		9.8	7.8	8.6	12.0	12.0	8.4	4.6	5.3	8.8	10.3
1941		11.0	22.0	16.6	11.5	6.5	14.1	10.8	2.8	7.1	10.0
1942		7.6	12.0	9.1	10.3	6.6	7.6	5.2	5.7	8.2	7.0
1943		11.2	16.5	13.5	9.7	9.5	5.8	6.5	9.1	11.4	15.7
1944		14.1	19.6	16.5	14.5	12.6	14.2	13.6	6.2	7.6	10.1
		Recorded case fatality (percent)									
Average[4] 1930–44		11.8	7.7	9.5	10.7	12.9	14.0	18.6	25.3	14.8	8.1

See footnotes on following page.

If the analysis is carried to States, there were some in every section that were little affected by epidemics which were severe in other States in the same region. Dauer (*4*) has for many years carried the analysis to counties and has shown that a rather severe epidemic is frequently confined to groups of counties within one or two States, with rather low rates in other counties in the same State.

This discussion thus far has related to chronological variation within adjacent sections. Figure 1 may be viewed also from the point of view of given epidemics in the nine regions. For this purpose, adjacent years may be considered often as representing a single outbreak. In the 1943 and 1944 epidemics the Pacific, Mountain, and West South Central sections had large peaks in 1943, with the 1944 peak almost negligible in comparison. On the other hand, in the East South Central, South Atlantic, and Middle Atlantic sections the 1943 peaks were negligible and the large epidemics occurred in 1944. In the East and West North Central and New England regions the 2 years had peaks of roughly the same height. Other years show similar variations. In the 1930 and 1931 epidemics, the western regions (including the West North Central) had large peaks in 1930, but in the more eastern sections the 1931 peaks were much higher. Again in 1934 and 1935 the large peaks in the West came in 1934, but in the East the epidemic year was 1935. Because the East represents much the greater proportion of the total population of the country, the chronology of the epidemics as reflected in the graph for all regions (top of fig. 1) is more similar to that in the eastern than in the western sections of the country.

It may be seen in figure 1 that the peak months are frequently earlier in the South than in other sections. Computing from weekly data, the median date of the peak week in the 15 years 1930–44 is

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(Footnotes from p. 330)

[1] Deaths and cases as reported to the U. S. Public Health Service by State health departments and as plotted by month in fig. 1. Death data from the U. S. Bureau of the Census are not available by month and geographic section. Figures from Annual Summaries of Notifiable Diseases in States (*12*) supplemented by unpublished data, U. S. Public Health Service.

[2] U. S. Bureau of the Census geographic sections are used.

[3] Poliomyelitis was reportable in all States throughout this 15-year period with the possible exception of Texas.

The Biennial Report of the Texas State Department of Health for 1927–28 states that all communicable diseases are reportable in Texas, and shows a tabulation of reported poliomyelitis cases by months. However, poliomyelitis does not appear to have been listed by name in the Texas statutes as a reportable disease until some time after 1936.

The exclusion of Texas from the West South Central section in the computation of case and death rates increases the cases per death (based on averages of case and of death rates) for that section by 24 percent (2.9 to 3.6 cases per death) for 1930–38 when the disease was not listed in the statutes as reportable, as compared with an increase of 20 percent (5.9 to 7.1 cases per death) for 1939–44, when it was presumably listed in the statutes by name. It appears that reporting in Texas in both periods was somewhat less complete than in the West South Central section as a whole, but that the small difference between the two periods hardly justifies its exclusion from the tabulation for 1930–38.

In the earlier years covered by this table, several States reported fewer cases of poliomyelitis than there were deaths registered. In the years 1930–33 this situation occurred twice in Texas, Arkansas, Kentucky, Georgia, and Florida, and once in Oklahoma and Colorado.

The various data summarized above seemed to indicate that reporting in Texas was about as good as in adjacent States so Texas is included along with the other States.

The cases per death for the West South Central section exclusive of Texas were as follows: 4.9, 1.2, 1.7, 1.4, 2.0, 4.0, 3.4, 5.1, 2.5, 3.8, 5.9, 3.0, 7.0, 14.0, and 9.4 for 1930 to 1944, respectively.

[4] For case and death rates the 1930–44 figure is a simple average of the 15 annual rates. For cases per death and case fatality, the 1930–44 figures are ratios computed from the simple averages of the rates.

4 weeks earlier in the South (centering about August 15) than in the North and West (centering about September 12). It must be remembered that there is a lag of at least a week between the peak week in terms of the onset of the case and the peak week of reporting.

No table of monthly rates as plotted in figure 1 is included, but table 1 shows by geographic region annual case rates, death rates, and reported cases per death for each of the 15 years.

HISTORY OF POLIOMYELITIS AS OBTAINED BY A FAMILY SURVEY

It is of interest to compare the poliomyelitis situation as indicated by reported cases and deaths with information obtained by house-to-house canvass. Early in 1936 some 200,000 families in 28 large cities (*3*) were canvassed to obtain data on the acute communicable diseases, including poliomyelitis. It has been found in other surveys (*1*) that mothers give a reasonably accurate account of which of the communicable diseases each of their children has had. Since infantile paralysis is a dangerous disease which is known and feared by most mothers, it was felt that reasonably complete histories of its occurrence could be obtained. In this communicable disease study each family informant, usually the mother, was questioned about attacks of infantile paralysis at any time since birth among the children of the household head; such data were recorded for persons under 25 years of age at the time of the survey.

In the tabulation of the history data the period since birth was divided into the "study year," defined as the 12 months immediately preceding the interview, and the time prior to that year. Therefore, the history data here presented represent attacks prior to the early months of 1935 and ages are stated as of January 1, 1935. To avoid language difficulties, the tabulations of prior histories all refer to children of native white household heads. It was found that some foreign-born parents were unfamiliar with the English names of childhood diseases and consequently the reports for their children were not as complete as those for children of native parents.

Age-sex differences.—Table 2 shows history rates per 1,000 living children of the different age groups for both sexes and for boys and girls separately. All of the rates increase with age because history data of this kind are cumulative in nature; that is, such a rate for persons 15-19 years of age represents attacks over the whole 15 to 19 years of each individual's life and would, therefore, be higher than such histories for children under 5 years of age who have had less than 5 years of exposure to attack.

The history among the living of all types of poliomyelitis rises from 1.1 per 1,000 children under 5 years of age to 5.7 for children 15–19 years of age at the time of the survey. Since the survey data pertain to 1935, few of the children who were under 20 years of age were

born prior to the great 1916 poliomyelitis epidemic, but those who were over 20 had all lived through that epidemic as well as other less extensive outbreaks since 1916. Thus the history of infantile paralysis for the 20–24-year group is 9.4 per 1,000 living persons, or about 65 percent above that for the next younger age group.

TABLE 2.—*History of poliomyelitis at any time since birth among persons of specific ages for each sex—children of native white parents [1] in 28 surveyed cities, 1935–36*

	Living resident and nonresident children of native white parents [1]						Living resident, nonresident, and dead children of native white parents [1]					
	Under 5	5–9	10–14	15–19	20–24	Number with history, 0–24 years [2]	Under 5	5–9	10–14	15–19	20–24	Number with history, 0–24 years [2]
	History [3] of poliomyelitis at any time since birth per 1,000 persons of specific ages [4]											
All poliomyelitis:												
Both sexes	1.07	3.69	5.64	5.70	9.37	809	1.14	3.93	6.01	6.17	11.01	897
Male	.86	3.44	5.79	6.25	8.51	403	.96	3.68	6.04	6.74	10.39	449
Female	1.29	3.94	5.48	5.19	10.28	406	1.34	4.18	5.99	5.62	11.68	448
All paralytic [5] cases:												
Both sexes	.79	2.37	4.04	4.46	6.61	582	.87	2.60	4.40	4.95	8.29	668
Male	.70	2.10	4.11	4.97	5.71	287	.80	2.34	4.32	5.50	7.62	332
Female	.89	2.66	3.97	3.97	7.58	295	.94	2.81	4.49	4.42	9.01	336
Paralytic with residual effects: [5]												
Both sexes	.55	1.54	3.04	2.97	4.81	409	.63	1.79	3.41	3.50	6.42	494
Male	.54	1.55	3.17	3.15	4.45	208	.64	1.84	3.39	3.72	6.29	253
Female	.56	1.54	2.92	2.81	5.19	201	.61	1.74	3.44	3.28	6.55	241
Fatal cases:												
Both sexes	------	------	------	------	------	---------	.08	.20	.40	.56	1.58	80
Male	------	------	------	------	------	---------	.11	.25	.29	.65	1.72	43
Female	------	------	------	------	------	---------	.06	.15	.50	.47	1.43	37
	Number of persons [2] covered by survey											
Both sexes	36,531	39,579	40,102	36,986	19,962	173,160	36,734	39,688	40,423	37,747	20,258	174,850
Male	18,647	20,036	20,206	18,092	10,336	87,317	18,760	20,097	20,378	18,539	10,494	88,268
Female	17,884	19,543	19,896	18,894	9,626	85,843	17,974	19,591	20,045	19,208	9,764	86,582

[1] Own, step, and adopted children of white native-born household heads.
[2] Case histories for nonresident and dead children are counted only to the time they left the household, and the persons considered are expressed as equivalent full-time persons.
[3] Histories include attacks from birth until the beginning of the study year (spring 1935). Cases during the year immediately preceding the family interview are tabulated as current incidence (tables 6, 9, and 11).
[4] Ages of living persons are expressed as the attained age (last birthday) at the beginning of the study year. Ages of nonresident and dead persons represent the age they would have attained at the time of the survey. This method is equivalent to classifying all persons according to year of birth—thus ages 20–24 years (living resident, nonresident, and dead) all represent persons born in the years 1911 to 1915, and ages 10–14 represent children born in the years 1921–25.
[5] All fatal cases are assumed to be paralytic and are classified with the most severe type—paralytic with residual effects. However, a few dead children had a history of nonfatal poliomyelitis with death at a later date from another cause; such cases were tabulated as the type specified by the informant.

Only a limited number of the nonparalytic cases would be known and reported in this survey. The history of paralytic cases rises from 0.8 per 1,000 living children under 5 years to 4.5 for persons 15–19 years old and 6.6 at 20–24 years. Paralytic cases with residual effects amount to 0.6 per 1,000 children under 5 and to 3.0 and 4.8 at 15–19 and 20–24 years, respectively.

In the milder childhood diseases, the few fatal cases can be neglected in tabulating the proportion of children with a history of the disease. However, the 5 to 10 percent of poliomyelitis cases that are fatal

seems too much to neglect. To obtain records for approximately all of the children under 25 years of age who live or have grown up together in a family, the household census was expanded to include all children of the head who were born within 25 years of the date of the survey, including the dead and those who were no longer residing at home. The usual facts such as age, sex, nativity, and color were entered on the schedule for all dead and nonresident as well as resident children; if any child of any of these categories had had either a fatal or nonfatal attack of infantile paralysis at any time from birth to the time he left the household, that information was also entered. In making the tabulation the dead and nonresident children were counted as under observation only for the years during which they were actually living at home with the family. Thus for the cohort born in 1916–20 (15 to 20 years prior to these 1935 data) the individuals living at home would have spent an average of 17.5 years in the household; for the dead and nonresident in this cohort the aggregate years of life spent in the home was divided by 17.5 to obtain the equivalent in terms of individuals in this cohort who had lived in the family the whole time since their birth. With this population base for each of the cohorts which, among the living, represents persons of each 5-year age group at the time of the survey, rates per 1,000 persons were computed for histories of (*a*) all attacks (nonparalytic and paralytic), (*b*) all paralytic attacks, (*c*) paralytic attacks with residual effects (deformity. crippling, or death), and (*d*) fatal cases.

Figure 2 shows these data on the history of nonfatal and fatal poliomyelitis as a bar chart hatched in such a way that the rates per 1,000 for each of the 4 categories can be seen on the chart. This figure can be considered as representing in a rough way what happens to a group of 1,000 children born at a given time and followed until 25 years of age to record cases (nonfatal and fatal) of poliomyelitis that occurred among them. However, poliomyelitis occurs in rather large epidemics and these observed poliomyelitis histories may deviate considerably from average rates such as might be computed by graduating the data as in life tables.

According to these family reports, 6.2 per 1,000 children of the ages 15–19 had a history of poliomyelitis at some time since birth, of which 5.0 were paralytic and 3.5 had some residual paralysis or died from the disease. The histories of fatal cases amounted to 0.56 per 1,000 persons 15–19 years old at the time of the survey. The proportions for persons 20–24 years of age are much higher than those for 15–19 years. As noted above, this sudden increase presumably is caused by the fact that children who at the time of the survey were 20–24 years of age had lived through the great 1916 epidemic of poliomyelitis.

The right half of figure 2 shows the same types of histories of poliomyelitis among males and females of the several age groups; there

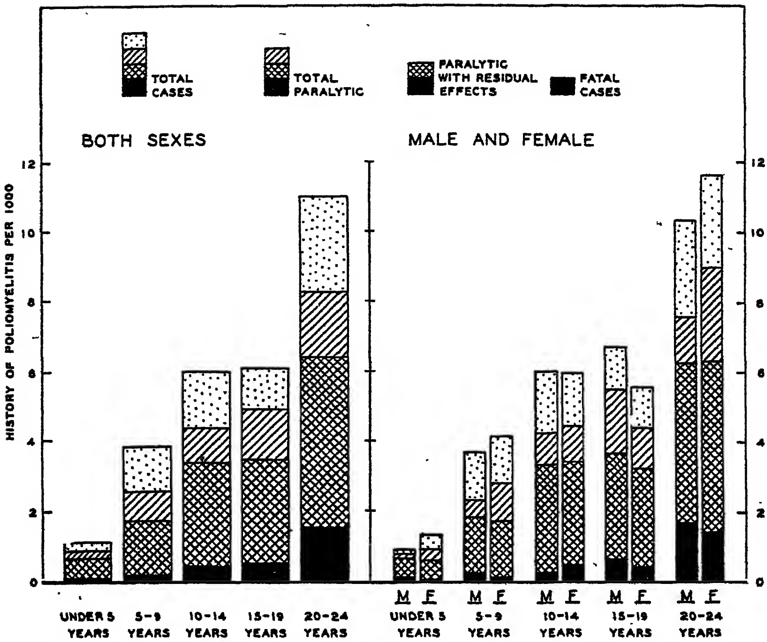

FIGURE 2.—History of poliomyelitis of various types at any time since birth among persons of specific ages at the time of the canvass—resident, nonresident, and dead children of native white household heads in 28 large cities, 1935-36.

appear to be no consistent differences of any importance between boys and girls. Particularly is this true of poliomyelitis with residual effects which would be the most accurate data. Presumably the recorded histories of nonparalytic cases represent only a small proportion of the total nonparalytic cases since many would occur without being diagnosed as poliomyelitis.

Geographic variation.—Table 3 and figure 3 show by age the histories for northern cities (Northeast and North Central) as compared with southern cities (South and Intermediate). Although the differences are not large, the South shows rather consistently lower history rates than the North.

Table 4 shows for five geographic regions the average of the rates for the history of poliomyelitis for the four 5-year age groups under 20 years, and the average for the two 5-year age groups from 10 to 20 years which represents about the asymptote of the history curves when the abnormally high rates at 20–24 years are disregarded. Because of small numbers, data for each age group are not presented.

Averages for both age groups for the living and dead for all poliomyelitis (paralytic and nonparalytic) shows higher history rates in the West than in any other section, the Northeast and North Central coming next, and the South having the lowest rates. However, the excess for the West is not large for paralytic cases, and for paralytic

TABLE 3.—*History of poliomyelitis at any time since birth among persons of specific ages in 15 northern and 8 southern surveyed cities—children of native white parents,*[1] *1935–36*

Geographic section [6]	Living resident and nonresident children of native white parents [1]: Under 5	5–9	10–14	15–19	20–24	Number with history 0–24 years [2]	Living resident, nonresident and dead children of native white parents [1]: Under 5	5–9	10–14	15–19	20–24	Number with history 0–24 years [2]
	History of poliomyelitis at any time since birth per 1 000 persons of specific ages [4]											
All poliomyelitis												
Northern cities	[illegible]	3 91	[illegible]	[illegible]	[illegible]	461	1 38	4 20	[illegible]	6 01	12 00	510
Southern cities	[illegible]	2 17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2 16	[illegible]	[illegible]	[illegible]	231
All paralytic [5] cases												
Northern cities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 02	[illegible]	[illegible]	4 93	[illegible]	376
Southern cities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 80	7 41	187
Paralytic with residual effects [5]												
Northern cities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2 02	3 36	[illegible]	6 46	284
Southern cities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 04	[illegible]	3 20	5 78	143
	Number of persons covered by survey											
Northern cities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22 343	20 293	10 826	99 241
Southern cities	10 465	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13 640	[illegible]	[illegible]	55 909

1–5 See notes on table 2

6 Northern cities include Northeast and North Central and Southern cities include Intermediate and South as listed in the note to table 4

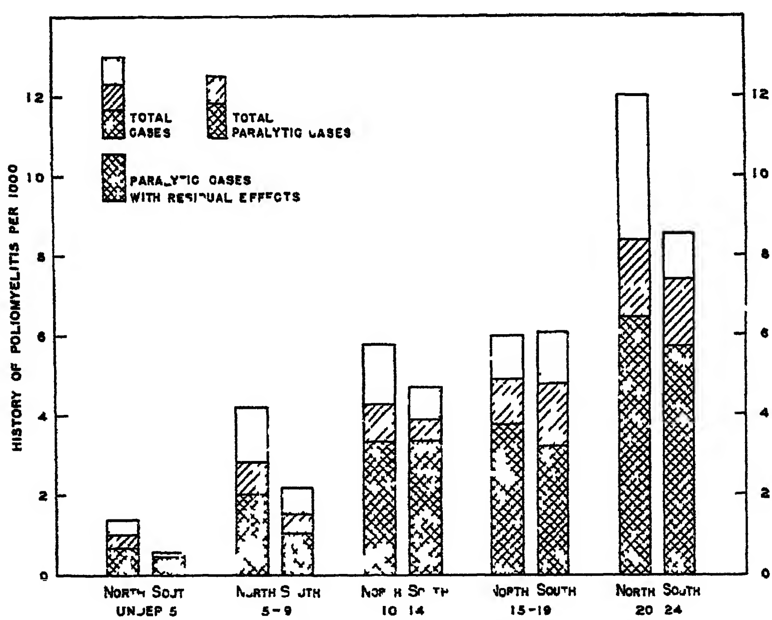

FIGURE 3.—History of poliomyelitis of various types at any time since birth among persons of specific ages at the time of the canvass—resident, nonresident and dead children of native white household heads in 15 northern and 8 southern cities, 1935–36

cases with residual crippling effects the North Central is actually above the West. It appears, therefore, that the excessively high rates reported in the West may be caused by the inclusion of more nonparalytic cases than in other sections.

It is of interest to compare the history rates with those for currently reported cases. The average annual poliomyelitis incidence as reported to the health departments of the 28 surveyed cities during the 15 years preceding the survey was 5.65 cases per 100,000 total population. In survey data to be presented later (table 6), it was found that in 1935 the poliomyelitis case rate for white persons under 15 years of age was 3.6 times the rate for all ages; if this ratio is assumed to apply to the reported case rate of 5.65, it can be estimated that the rate for children under 15 years of age was 20.3 per 100,000 population of this age group. As this figure represents the average annual rate for children under 15 years of age, a group of children passing from birth through the fourteenth year of age would be expected to cumulate histories amounting to 15 times this rate, or 304 per 100,000 persons, or about 3.0 per 1,000 persons. This 3.0 per 1,000 is, therefore, roughly comparable with 6.1 per 1,000 as found by questioning the family informant. Thus the survey method in this study yielded twice as many histories as would be expected from the reported cases of poliomyelitis during the period under consideration.

At least part of this large discrepancy may be due to the inclusion of more nonparalytic[2] cases in the data reported in the family canvasses. When nonparalytic cases are excluded, the survey data indicate a history of 4.7 per 1,000 persons at roughly 15 years of age, and of these 3.5 per 1,000 had residual crippling effects or were fatal. When the dead are excluded and the history rate based on persons living at the time of the survey, the estimate of 3.0 based on reported cases is identical with the survey history rate among 15-year-old children; however, reported cases include fatal cases so there seems to be no good reason for excluding deaths from the computation.

A comparison of the history data in table 4 with currently reported case rates in figure 1 and table 1 are of interest as explaining some of the differences between the geographic sections. Histories of poliomyelitis cases at any time since birth, as shown in table 4, represent records as of the early months of 1935. It is seen in figure 1 that

[2] From data included in Dauer's report for 1944 (*4*), it appears that roughly two-thirds of the reported cases of poliomyelitis in 1943 and 1944 were paralytic. Data on reported cases for 8 to 11 States which from 1936 to 1940 recorded paralytic and nonparalytic cases separately indicate that about 80 percent of the cases were paralytic (*12*). In both instances there was much variation in the percentages from city to city and State to State.

In the canvassed population under 25 years of age, 74 percent of the total recorded histories were paralytic including the 9 percent that were fatal; of the paralytic cases, 74 percent had residual crippling effects including the 12 percent that were fatal; of the nonfatal paralytic cases, 70 percent had residual crippling effects (table 13).

the West (Mountain and Pacific regions) had its large epidemic in 1934 which would tend to increase the proportion of children with a history of poliomyelitis as of early 1935. However, in the Northeast (New England and Middle Atlantic) and in the South Atlantic, the 1934 rates were rather small and the large epidemic came in the summer of 1935 a few months after the date to which the histories in table 4 pertain. Moreover, the 1934 epidemic in the West included more than the average number of nonparalytic cases (*5*, *9*). These facts explain some of the excessively high history rates for total cases and the absence of any large excess for paralytic cases in the West, as recorded in the family survey (table 4).

TABLE 4.—*History of poliomyelitis at any time since birth among persons of certain ages in different geographic sections at the time of the survey—children of native white parents* [1] *in 28 surveyed cities, 1935–36*

Geographic section [6]	Living resident and nonresident children of native white parents [1]				Living resident, nonresident, and dead children of native white parents [1]			
	All poliomyelitis	All paralytic cases [5]	Paralytic [5] with residual effects	Number of persons covered by survey [2]	All poliomyelitis	All paralytic cases [5]	Paralytic [5] with residual effects	Number of persons covered by survey [2]
	History [3] of poliomyelitis at any time since birth per 1,000 children [3] under 20 years [7] of age [4]							
Northeast	3.8	2.8	1.9	48,178	4.1	3.1	2.2	48,641
North Central	4.3	3.1	2.5	39,418	4.6	3.4	2.8	39,774
Intermediate	3.2	2.5	1.8	26,301	3.4	2.8	2.1	26,548
South	3.2	2.4	1.8	22,406	3.3	2.6	1.9	22,613
West	6.4	4.0	2.1	16,835	6.9	4.4	2.6	17,016
All sections	4.0	2.9	2.0	153,198	4.3	3.2	2.3	154,592
	History [3] of poliomyelitis at any time since birth per 1,000 children [3] 10–19 years [8] of age [4]							
Northeast	4.9	3.8	2.6	23,219	5.3	4.2	3.0	23,568
North Central	6.2	4.6	3.8	18,784	6.6	5.1	4.2	19,068
Intermediate	5.3	4.2	3.1	13,856	5.8	4.8	3.7	14,049
South	4.6	3.6	2.5	11,939	4.9	3.8	2.8	12,094
West	8.5	5.3	2.8	9,240	9.2	6.0	3.4	9,391
All sections	5.7	4.2	3.0	77,088	6.1	4.7	3.5	78,170

1–5 See notes on table 2.
6 Cities in each section: *Northeast:* Boston, Fall River, Buffalo, Syracuse, Newark, Trenton, Philadelphia, Pittsburgh; *North Central:* Cleveland, Columbus, Detroit, Flint, Grand Rapids, Chicago, St. Paul; *Intermediate:* Baltimore, Richmond, St. Louis; *South:* Atlanta, Birmingham, New Orleans, Dallas, Houston; *West:* Salt Lake City, Oakland, Portland, Seattle, Spokane.
7 Simple average of rates for the four 5-year age groups.
8 Simple average of the rates for the two 5-year age groups.

Comparison with other diseases.—The frequency of poliomyelitis may be compared with that of other of the more rare communicable diseases. Figure 4 shows by age the history of poliomyelitis and rheumatic fever among children (living and dead) of native white household heads. It should be noted that no inquiry was made about the presence of rheumatic heart disease, so a history of rheumatic fever

means that the person had suffeied a frank attack at some time since birth. The data indicate much less rheumatic fever than poliomyelitis among children under 5 years of age. At the other ages under 20 years the rheumatic fever history rates are greater than those for paralytic poliomyelitis but about the same as for all poliomyelitis. At 20–24 years the poliomyelitis rate is higher, for reasons already discussed.

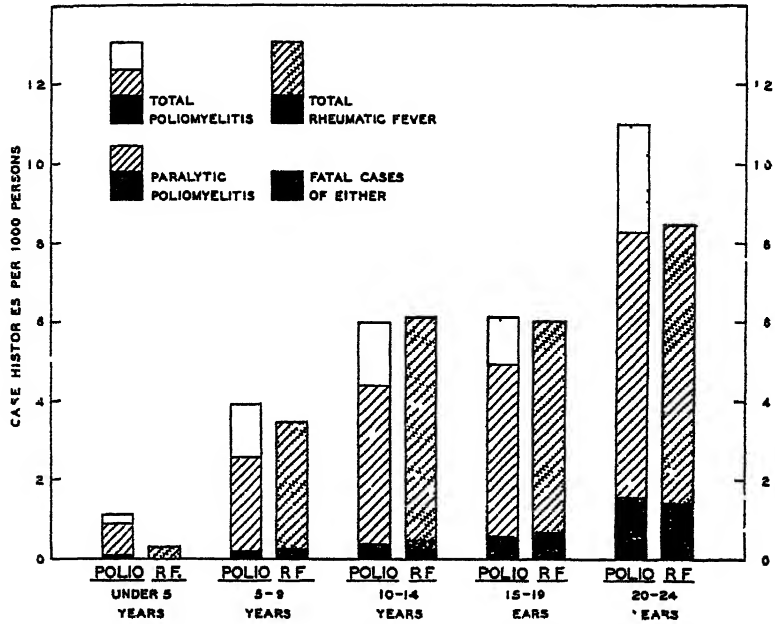

FIGURE 4.—Comparison of history rates at any time since birth of poliomyelitis and rheumatic fever among persons of specific ages at the time of the canvass—resident, nonresident, and dead children of native white household heads in 28 large cities, 1935-36.

Little satisfactory information was obtained on the history of meningitis in the Communicable Disease Study, but a tabulation of reported cases and deaths in the United States for the period 1930–44 indicates an average annual incidence of 6.7 cases per 100,000 for poliomyelitis (table 1) and 4.6 for meningococcus meningitis (*6*). The death rates per million were 7.9 for poliomyelitis and 17.1 for meningitis. The case fatality was obviously much lower for poliomyelitis than for meningitis, but since about 1937 the fatality of meningitis has decreased greatly (*6*).

In the 15 years 1921–35 just preceding the family survey, the reported annual case rates in the 28 large cities were 5.6 per 100,000 for poliomyelitis and 5.8 or about the same for meningitis; corresponding death rates were 8.1 per million for poliomyelitis and 29.3 for meningitis.

PREVALENCE AND CHARACTER OF CRIPPLING EFFECTS

In the Communicable Disease Study (*3*) made in 28 large cities in the spring of 1936, the family informant was asked specifically whether anyone in the family under 25 years of age at the time of the survey had ever had poliomyelitis. If anyone reported an attack, it was recorded as nonparalytic, paralytic with complete recovery, or paralytic with residual effects. This method of questioning revealed that 2.4 per 1,000 living white children (of native household heads) under 25 years of age at the time of the survey had suffered attacks of poliomyelitis from which there were residual effects. The larger National Health Survey (*11*) made in 1935–36 recorded disabling and chronic diseases in 27 of the 28 Communicable Disease Study cities and also in 4 other large cities and many smaller towns.[3] Although this survey included no specific inquiry about poliomyelitis, the informant was asked whether anyone in the household was paralyzed, deformed, or crippled. If there was a person in the household with any such orthopedic impairment, the disease or the type of accident which caused the condition was recorded in some detail. This method of questioning revealed that 1.6 per 1,000 living white persons under 25 years of age had an orthopedic impairment which was the result of a prior attack of poliomyelitis (table 5). This figure of 1.6 per 1,000 persons under 25 years of age is comparable with the rate of 2.4 for the Communicable Disease Study where special inquiry was made about poliomyelitis. The corresponding rates for persons under 15 years of age were 1.2 per 1,000 for the National Health Survey and 1.7 for the Communicable Disease Study. The specific inquiry would be expected to find more cases than the general inquiry, but the difference is rather large. At each of the age groups under 25 years the more general question asked in the National Health Survey revealed relatively fewer cases than the specific question about poliomyelitis. It should be noted, however, that a paralytic case was defined in the Communicable Disease Study to include any with muscular weakness whether or not there was complete paralysis.

Since the National Health Survey recorded all types of orthopedic impairments, the proportion of all crippling cases that were due to poliomyelitis can be computed. Among all persons under 25 years of age with orthopedic impairments (exclusive of lost members), 30 percent reported the impairment as caused by poliomyelitis. If impairments of major members only (excluding fingers and toes) are considered, 32 percent of all persons under 25 years of age with such impairments reported them as due to poliomyelitis. Among children under 15 years of age, 28 percent of those with major impair-

[3] No blocks in any community were canvassed by both surveys.

ments reported the cause as poliomyelitis; the figures were 14 percent for children under 5, 30 percent at ages 5–9, and 31 percent at 10–14 years.

TABLE 5.—*Orthopedic impairments*[1] *resulting from prior cases of poliomyelitis among persons in 83 cities in 18 States, National Health Survey, 1935–36*

	All known ages	Age								
		Under 25	Under 15	Under 5	5–9	10–14	15–24	25–44	45–64	65 and over
Persons with impairments due to poliomyelitis per 1,000 canvassed population	1.30	1.62	1.16	0.31	1.28	1.72	2.24	1.40	0.66	0.47
Percent of impaired[2] persons in which the orthopedic defect was due to poliomyelitis	11.0	30.1	27.1	13.8	29.2	29.7	32.6	14.3	3.6	1.0
Percent of seriously impaired[3] persons in which the orthopedic defect[3] was due to poliomyelitis	11.9	31.8	28.3	14.4	30.0	31.4	34.7	15.9	3.9	1.1
Distribution of persons[4] impaired by poliomyelitis according to parts of the body affected:										
Any part of the body	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 foot or leg	55.8	55.2	56.0	52.1	58.9	54.7	54.7	56.7	56.8	50.0
Both feet or legs	16.4	15.6	14.5	25.0	15.7	12.5	16.2	17.9	15.9	15.6
1 hand or arm and 1 foot or leg	11.0	9.9	10.9	6.2	8.5	13.0	9.3	11.0	14.0	23.4
1 hand or arm	7.6	9.3	9.5	8.3	8.0	10.6	9.1	6.0	4.9	7.8
Both hands or arms	.5	.5	.5	------	------	.8	.5	.5	1.0	------
3 or more major members or entire body	3.2	3.6	4.0	4.2	3.4	4.3	3.4	2.8	2.3	1.6
Spine, back, or trunk	4.9	5.5	4.8	2.1	5.1	4.1	6.3	4.4	4.5	1.6
Fingers and toes only	.6	.4	.3	2.1	.4	------	.5	.7	.6	------
Number of persons with impairments due to poliomyelitis	3,237	1,698	699	55	259	385	999	1,149	323	67
Number of persons canvassed (in thousands)	2,498	1,049	603	176	203	224	446	821	486	142

[1] Unpublished data from National Health Survey (*7, 11*).
[2] "Impaired" as here used does not include lost members.
[3] Severe impairments include all orthopedic defects (excluding losses) except of the fingers and toes.
[4] For 142 persons impaired by poliomyelitis the part of the body affected was not stated; in computing these percentages these unknowns are eliminated. The unknowns were distributed by age as follows: Under 5=7; 5–9=23; 10–14=16; 15–24=31; 25–44=47; 45–64=15; 65 and over=3.

It is probable that more minor residual effects were recorded in the Communicable Disease Study than in the National Health Survey. However, it was only in the latter that the site and extent of the crippling or paralysis was recorded. The proportions of persons with residuals of poliomyelitis that affect different parts of the body are shown by age in table 5. The percentages of the cases with crippling of various members of the body do not differ radically with age, although there is some variation; for convenience children under 15 years at the time of the survey will be discussed here. In this age group 56 percent of the crippling from poliomyelitis involved one foot or leg, with 15 percent more that involved both feet or legs; 11 percent affected one foot or leg and one hand or arm, and 4 percent involved three or more major members or the entire body. Another 4 percent involved the spine, back, or trunk and in many of these cases the legs must have been affected. Paralysis involving only the arms or hands was much less frequent, 9 percent of the

cases affecting one hand or arm, and 0.5 percent involving both hands or arms. Only 0.3 percent of the cases reported paralysis or crippling of only the fingers or toes. To summarize, in 85 percent of the children under 15 years of age with residuals of poliomyelitis, the crippling involved the feet or legs (with or without other parts of the body), as compared with 25 percent which involved the hands or arms (with or without other members).[4]

VARIATION IN POLIOMYELITIS INCIDENCE AND MORTALITY

Because of the relative infrequency of poliomyelitis, it has been impracticable to collect data on the age and sex incidence of the disease by house-to-house canvass except during sizable epidemics (*5, 8, 9*). The National Health Survey of 1935–36 and the supplementary Communicable Disease Study of the spring of 1936 covered 917,000 white and colored urban households. The National Health Survey schedule included an inquiry about all illness within the preceding year (roughly 1935) which caused inability to attend school, work, or pursue other usual activities for 7 consecutive days or longer. The Communicable Disease Study included a specific inquiry about all cases of poliomyelitis which occurred within the year preceding the interview. The two surveys covered a total of 2,923,000 white persons and recorded for this population 424 cases[5] of poliomyelitis with onset within the study year. Figure 5 shows age-specific rates for this population group.

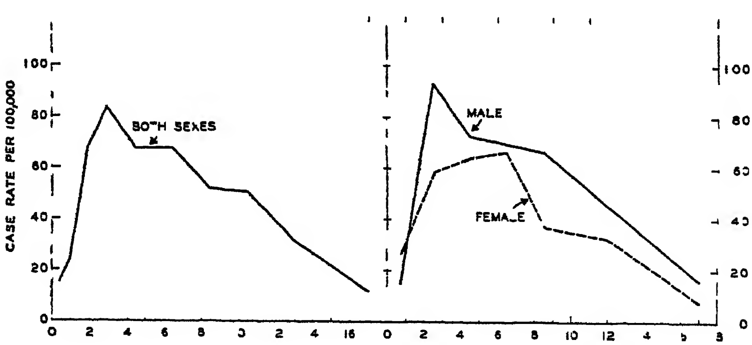

FIGURE 5.—Age incidence of poliomyelitis during the study year among persons of each sex—canvassed white families in 84 cities and towns in 19 States, 1935–36

[4] Of the 277 cases under 15 years of age with onset during the study year, only 43 of the records specified the parts of the body currently affected. These may be compared with the old cases with residual effects. The feet or legs (with or without other parts of the body) were affected in 79 percent of the current cases, as compared with 85 percent for the old residual effects. The hands or arms (with or without other parts) were affected in 16 percent of the current cases, as compared with 25 percent for the old residuals. Thus the two series agree in that the feet and legs were most frequently affected.

[5] In the smaller Communicable Disease Study the cases were recorded as paralytic and nonparalytic, but in the larger National Health Survey no such distinction was made. Every case represents at least 7 days of inability to pursue usual activities.

Variation with age.—The highest incidence in these data for approximately 1935 occurred at 3 years of age, after which there was a more or less regular decline as age increased. It is not possible to say with this number of cases whether the slackening of the decline at about the age of school entrance is significant, but the poliomyelitis death rate for the total United States in 1939–41 (table 7) is slightly higher at ages 5–9 than at 4 years.

TABLE 6.—*Age and sex incidence (new cases) of poliomyelitis per 100,000 population during the study year [1]—2,923,309 persons in canvassed white families in 84 cities and towns in 19 States, 1935–36*

Age last birthday at end of study year [1]	Annual case rate per 100,000					Number of cases					Total surveyed population, all areas [3]
	All surveyed areas			Both sexes		All surveyed areas			Both sexes		
	Both sexes	Male	Female	Northeast (epidemic)	All other sections (nonepidemic)	Both sexes	Male	Female	North east (epidemic)	All other sections (nonepidemic)	
All ages [2]	14.5	17.1	12.1	24.0	8.7	424	241	183	266	158	2,923,309
Ages under 15	51.7	58.6	44.8	89.1	28.0	350	200	150	234	116	676,467
Under 1	15.2	14.8	26.8	26.9	8.1	3	1	2	2	1	19,771
1	24.0			32.7	18.9	8	3	5	4	4	33,348
2	68.4	93.0	57.8	115.3	38.6	29	23	6	19	10	42,370
3	83.0			189.0	15.5	35	17	18	31	4	42,150
4–5	68.1	71.6	64.4	129.1	29.6	60	32	28	44	16	88,142
6–7	67.8	69.3	66.2	113.0	39.2	62	32	30	40	22	91,466
8–9	52.3	67.0	37.2	96.5	23.6	51	33	18	37	14	97,589
10–11	50.5	59.3	41.8	73.5	35.8	51	30	21	29	22	100,917
12–14	31.7	36.0	27.5	44.7	23.5	51	29	22	28	23	160,714
Under 5	60.3	62.0	58.6	123.1	21.5	109	57	52	85	24	180,742
5–9	59.4	71.1	47.4	100.8	32.9	139	84	55	92	47	234,094
10–14	39.0	44.9	33.0	55.8	28.2	102	59	43	57	45	261,631
15–19	11.8	15.9	8.1	16.4	8.8	31	20	11	17	14	262,162
20–24	7.3	6.7	7.8	7.1	7.5	19	8	11	7	12	259,135
25–34	2.8	3.0	2.6	2.8	2.8	14	7	7	5	9	498,910
35 and over	.8	1.0	.6	.7	.9	10	6	4	3	7	1,221,906
Surveyed population, all ages (in thousands)						2,923	1,411	1,512	1,108	1,815	

[1] Study year refers to the 12 months immediately preceding the single interview of the family informant by which the sickness data were obtained. Age is recorded as last birthday at time of interview.
[2] The total for all ages includes a few of unknown age.
[3] The population used for under 1 year of age represents one-half of the persons born during the study year since the time they were under observation would average one-half year.

The data on cases in the surveyed population may be supplemented by recorded deaths in the United States. Because of the inaccuracy of age-specific population estimates at intercensal periods, the deaths for the 3 years 1939–41 and the 1940 census have been used for computing rates. The data include both urban and rural areas and are, therefore, not strictly comparable with the urban survey case data. Unlike most diseases, there is less relative variability with age in poliomyelitis death rates than in case rates. The death rate under 1 year of age is somewhat less than at the maximum which occurs

among 1-year-old children. After this peak there is a moderate decline to 4 years, with the rate at 5–9 years slightly above that at 4 years and about equal to the rate at 3 years of age. Poliomyelitis death rates at 10–14 and 15–19 years are less than at 5–9 years, but the relative decline is not as great as in the case incidence. Translated into case fatality, this would mean that a higher percentage of the cases among adults would be fatal than among children under 15 years, and this is what was found when the few deaths in the surveyed population were related to cases of the same ages.

TABLE 7.—*Annual mortality from poliomyelitis per million population of specific ages—continental United States, 1939–41*

Age	Annual death rate per million	Number of deaths	Age	Annual death rate per million	Number of deaths
All ages [1]	6.6	2,606	Under 5	18.6	587
			5–9	15.5	496
All ages under 15	15.3	1,515	10–14	12.3	432
			15–19	9.6	355
Under 1 [2]	18.9	135	20–24	6.3	220
1	23.2	143	25–34	4.5	287
2	18.7	123	35–44	2.3	127
3	15.3	97	45–54	.9	44
4	13.8	89	55 and over	1.0	57

[1] The total for all ages includes a few of unknown age.
[2] The rate for under 1 year is based on the number of live births instead of the enumerated population; all other rates are based on the census population of 1940.

Sex differences.—Figure 5 also shows the incidence of poliomyelitis during the study year among boys as compared with girls. At every age except under 2 years the rate is definitely lower for girls than boys. This is the opposite of diphtheria incidence in this group which was consistently higher for females than males above 4 years of age although slightly lower for females under that age. It is also unlike scarlet fever incidence which was practically identical for boys and girls.

TABLE 8.—*Annual poliomyelitis death [1] rates per million white male and female residents of each geographic [2] section, with rates for colored in the South—United States, 1939–41*

Geographic section [2]	Annual death rate per million		Number of deaths		Geographic section [2]	Annual death rate per million		Number of deaths	
	Male	Female	Male	Female		Male	Female	Male	Female
All sections	8.3	5.1	1,473	891	South Atlantic:				
					White	9.3	6.2	184	122
New England	3.1	1.1	38	14	Colored	7.1	5.5	49	40
Middle Atlantic	5.2	2.8	203	110	East South Central:				
East North Central	9.1	4.5	353	169	White	10.9	9.5	131	113
West North Central	12.8	7.4	254	144	Colored	7.4	6.5	30	28
Mountain	9.5	7.5	59	43	West South Central:				
Pacific	9.1	5.9	130	82	White	7.6	6.0	121	94
					Colored	9.0	4.2	33	16

[1] Deaths are allocated to the residence of the deceased.
[2] U. S. Bureau of the census sections are used.

Death rates from poliomyelitis are shown in table 8 for white males and females in each of the nine geographic sections of the United States for the years 1939–41. In all sections combined the annual death rate for white males of all ages was 8.3 per million as compared with 5.1 for white females. In every section the rate for white males was higher than for white females, and in each of the three southern sections the poliomyelitis death rate for colored males was higher than for colored females. Deaths for colored in the other sections were too few for reliable rates.

Racial variation.—A considerable colored population was covered in the two sickness surveys (table 9). There is the possibility, however, that reports from the colored were not as complete or in other respects were not comparable with those from the white. The 20 cases of poliomyelitis recorded for the colored during the study year amounted to an incidence of 6.2 per 100,000 as compared with 14.5 for white persons. Of the colored cases 17 were under 15 years of age which gives a rate of 19.5 for the colored as compared with 51.7 per 100,000 white persons of those ages. However, most of the colored people lived in the South and Intermediate cities and rates were computed for white and colored in those places only; the case incidence for colored children under 15 years of age was 17.9 as compared with 22.1 per 100,000 for white. Thus the difference between the rates is not so large when the comparison is limited to the South.

TABLE 9.—*Incidence of poliomyelitis per 100,000 white and colored population during the study year* [1]*—canvassed families in 84 cities and towns in 19 States, 1935–36*

	All canvassed areas				Under 15 years			
	All ages [2]		Under 15 years		Northeast		South and Intermediate	
	White	Colored	White	Colored	White	Colored	White	Colored
Annual case rate per 100,000	14.5	6.2	51.7	19.5	89.1	22.8	22.1	17.9
Number of cases	424	20	350	17	234	4	35	9
Number of persons canvassed	2,923,309	321,707	676,467	87,036	262,482	17,578	158,416	50,364

[1] Study year refers to the 12 months immediately preceding the single interview of the family informant by which the sickness data were obtained. Age is recorded as last birthday at time of interview.
[2] The total for all ages includes a few of unknown age.

In the South, poliomyelitis death rates for 1939–41 were lower for colored than for white persons (table 8). This was true for both males and females except for males in the West South Central region. In both urban (2,500 or over) and rural parts of the three southern sections combined, poliomyelitis death rates in 1940–41 for colored were less than those for white.[6]

[6] Data for 1939 are omitted from computations by size of city and for urban-rural classifications because 1939 deaths are classified by size of city in 1930.

Variation with size of city.—Poliomyelitis death rates for the 2-year period 1940–41 were computed for cities of different sizes in the whole country.[6] Table 10 shows for five geographic regions death rates from poliomyelitis among residents of four city-size classes. In the total United States the annual death rate per million in cities of 100,000 or more population was 4.5, the lowest for any of the 4 city-size categories. The rate for moderate-sized cities (10,000 to 100,000) was larger (6.8), and the rate for towns 2,500 to 10,000 was still larger (10.0), but for places under 2,500 and rural areas the rate was less, 8.0 per million. Thus the lowest death rate occurred in the largest cities with a consistent increase in the rate as size of city decreased, but with a rate in rural areas that was lower than in small towns but not as low as in large cities. This pattern is repeated consistently in each of the 5 geographic sections except that in the West and the West North Central regions the rural rate was about the same as the rate for large cities, and in the West the rate for small towns was less than for towns of 10,000 to 100,000. For both white and colored persons in the South, the poliomyelitis death rate in rural areas was higher than in urban areas (2,500 or over).

TABLE 10.—*Annual poliomyelitis death[1] rates per million residents of cities of different sizes, by geographic sections[2] of the United States, 1940–41*

Size of city in 1940 census	Annual poliomyelitis death rate per million						Number of deaths from poliomyelitis					
	All sections	Northeast	East North Central	West North Central	South[3]	West	All sections	Northeast	East North Central	West North Central	South	West
100,000 or over	4 5	2.1	5.1	9 2	6.4	6.6	515	121	127	83	97	87
10,000–100,000	6.8	3.4	8 3	11 6	8.0	8.8	455	89	114	60	126	66
2,500–10,000	10.0	5 7	13.8	15 7	10.0	7.6	318	51	77	54	93	43
Rural[4]	8.0	4.4	9.9	9.1	8.6	6.5	1,318	121	218	204	645	130

[1] Deaths are allocated to the residence of the deceased; 1939 data are omitted because deaths in that year are classified by size of city in 1930.
[2] U. S. Bureau of the Census sections are used except: *Northeast*=New England and Middle Atlantic, South=South Atlantic and East and West South Central; *West*=Mountain and Pacific.
[3] Poliomyelitis death rates per million residents of the South: White, urban (2,500 or over) 8 4, rural 9.1; colored, urban 5 9, rural 7 0.
[4] Rural includes villages with less than 2,500 population and open country.

Relative age curves for other communicable diseases.—The poliomyelitis epidemics covered by the surveys described in this paper were rather largely confined to the New England and Middle Atlantic States, designated here as the Northeast. In the surveyed cities of those States the case incidence among white children under 15 years of age was 89 per 100,000 persons, as compared with 28 for the cities in all other sections. Figure 6 shows in terms of the ratio of the rate for each age group to the rate under 15 years, the relative age curve for the Northeast where the disease was epidemic and for all other regions combined. Insofar as the small numbers of cases indicate,

[6] Data for 1939 are omitted from computations by size of city and for urban-rural classifications because 1939 deaths are classified by size of city in 1930.

the incidence in the epidemic region was relatively higher in the younger ages.

In the same surveys similar data were collected on other communicable diseases. Figure 6 shows relative age curves for poliomyelitis, diphtheria, scarlet fever, and whooping cough incidence. Actual rates for these diseases vary widely. For the ages under 15 years case rates per 100,000 were: Poliomyelitis 52, diphtheria 111, scarlet fever 1,080, and whooping cough 1,599. These curves are plotted in terms of the ratio of the rate for each age to the rate under 15 years. The curve for poliomyelitis is rather similar to that for diphtheria; both rise rapidly to 3 years, after which poliomyelitis declines rather

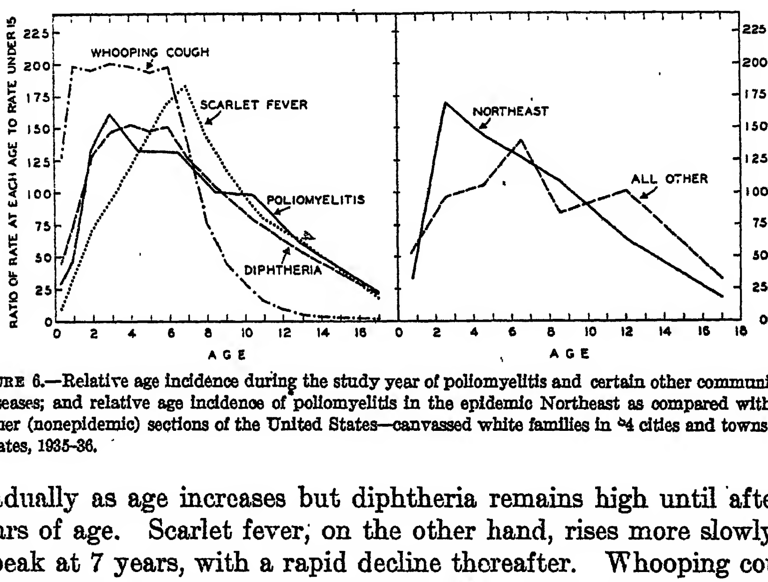

FIGURE 6.—Relative age incidence during the study year of poliomyelitis and certain other communicable diseases; and relative age incidence of poliomyelitis in the epidemic Northeast as compared with the other (nonepidemic) sections of the United States—canvassed white families in 84 cities and towns in 19 States, 1935–36.

gradually as age increases but diphtheria remains high until after 6 years of age. Scarlet fever, on the other hand, rises more slowly to a peak at 7 years, with a rapid decline thereafter. Whooping cough incidence is relatively low under 1 year of age, but is almost identical from 1 to 6 years, after which it declines more rapidly than any other disease on the chart. It should be noted that the data for large cities predominate in this surveyed group, although many smaller towns are included. The numbers of cases of poliomyelitis are not sufficient to compare the age incidence in small and large cities.

Variation with family income.—Family income during the study year was recorded in broad classes in both surveys. Table 11 shows poliomyelitis case rates by income and age for children less than 15 years old. As in other communicable diseases, high rates occur at earlier ages in the lower economic levels, presumably due to more contact in the crowded areas of the city. In this study the rates for children under 5 years decrease regularly as income increases, but the income differences are less in the other two age groups. In the lower income brackets the rates decrease regularly as age increases,

but the few cases in the higher income levels suggest higher rates between 5 and 15 years than in the youngest age group.

TABLE 11.—*Age incidence (new cases) of poliomyelitis per 100,000 population during the study year*[1]*—white children in families of different income levels in 84 surveyed cities in 19 States, 1935–36.*

Age	All surveyed areas					Northeast				
	All on relief	Annual family income for nonrelief households				All on relief	Annual family income for nonrelief households			
		Under $1,000	$1,000–$1,500	$1,500–$3,000	$3,000 or over		Under $1,000	$1,000–$1,500	$1,500–$3,000	$3,000 or over
	Annual case rates per 100,000 population									
All under 15	67	52	42	47	50	101	69	73	87	78
Under 5	81	74	53	49	28	140	179	125	84	76
5–9	75	51	41	64	45	119	81	64	126	50
10–14	50	38	34	32	65	58	59	42	56	102
	Number of cases									
Under 5	33	26	25	23	2	25	21	22	15	2
5–9	39	22	24	41	5	28	12	14	31	2
10–14	29	18	21	24	9	15	10	10	16	5

[1] Study year refers to the 12 months immediately preceding the single interview of the family informant by which the sickness and income data were obtained. Age is recorded as last birthday at time of interview.

REPORTED CASES AND CASE FATALITY

It is rather commonly assumed that a severe disease like the paralytic form of poliomyelitis is fairly completely reported to health departments. However, there is considerable evidence that by no means all of the cases come to the attention of the health authorities.

In the 28 large cities covered by the Communicable Disease Study, cases recorded in the family canvasses with onset within the study year were checked by name with the files of cases reported to the city health department by attending physicians, clinics, and hospitals. Table 12 shows the results of this check for poliomyelitis and 3 other communicable diseases. The proportion of poliomyelitis cases that were reported (74 percent) is not much above the figure for diphtheria (70 percent) and scarlet fever (73 percent) but is far above the more frequent childhood diseases represented by whooping cough with only 26 percent reported to health departments.

The results of such a check of individual names represents a minimum estimate of the completeness of reporting. Any name that was wrongly recorded on either the family survey or the physician's report to the health department may have resulted in counting the case as unreported. Moreover, a report on the family survey of a case that was not poliomyelitis and consequently not reported by the attending physician would also cut down the estimate of the percentage of cases reported.

TABLE 12.—*Percentage of cases of poliomyelitis and certain other communicable diseases recorded in the family survey that were located by name in the city health department files of reported cases—canvassed households in 28 large cities,[1] 1935–36*

Geographic section	Percentage of cases reported to health department						Total number of cases recorded in the family survey					
	Poliomyelitis			Diphtheria	Scarlet fever	Whooping cough	Poliomyelitis			Diphtheria	Scarlet fever	Whooping cough
	All types	Paralytic	Nonparalytic				All types	Paralytic	Nonparalytic			
All cities	74	73	77	70	73	26	86	51	35	227	2,315	4,065
Northeast	81	75	91	78	76	24	54	32	22	45	874	1,344
All other	62	68	54	68	72	26	32	19	13	182	1,441	2,721

[1] For list of 28 large cities included, see note 6 to table 4. Cases recorded in the canvass as occurring outside of the city (while on vacation, prior to coming to the city, etc.) are excluded from the computation, as are also cases in cities in which no file of cases was available for checking (whooping cough in Atlanta and Richmond). Whooping cough and poliomyelitis were not reportable in Dallas and Houston in 1935–36 but both are now reportable; no cases of poliomyelitis were recorded in the canvassed sample of those cities.

Another method of calculating completeness of reporting is to estimate the total cases in the surveyed cities from the canvassed family data and compare this figure with the actual reports for the whole of the cities. The cases from the Communicable Disease Study and the National Health Survey may be combined for this purpose. The National Health Survey covered 27 of the 28 large cities included in the Communicable Disease Study with samples that were roughly twice the size of the Communicable Disease samples;[7] in addition the Health Survey included samples from four other large cities—New York, Cincinnati, Minneapolis, and Los Angeles.

In the Northeast,[8] 8.44 percent of the total estimated population of the 9 large surveyed cities was covered. On the basis of the 249 new cases of poliomyelitis recorded in the family surveys in these cities, it was estimated that 2,950 cases occurred in the total population of these 9 cities. The actual number of cases reported to the health departments in these cities in 1935 (the approximate year of the survey [9]) was 2,799, which was 95 percent of the expected cases. Nonresident cases were eliminated from the number actually reported to the health departments in the cities where nonresident data were available, but, insofar as nonresidents were included, the figure of 95 percent reported would be too high since only resident cases were counted in the name check data shown in table 12. Moreover, New

[7] No blocks were canvassed by both surveys, so there is no duplication of cases when the two studies are combined. Baltimore was included in the Communicable Disease Study but not in the Health Survey tabulations.

[8] Northeast comprises New England and Middle Atlantic geographic sections as used in the Federal censuses.

[9] The National Health Survey was made between October 1935 and April 1936, and the Communicable Disease Study between March and June 1936. Since the first 5 months of the calendar year have the lowest incidence of poliomyelitis, the calendar year 1935 approximates the study year of 12 months preceding the interview in numbers of cases reported.

York City was not in the name check but contributed a larger number of well-reported cases to the other computation. Thus, the 95 percent is a liberal estimate of the maximum completeness of reporting in the Northeast, with the 81 percent obtained by the name check as a minimum.

Applying the same method to the 23 large cities in other geographic sections where poliomyelitis rates were lower, 11.64 percent of the population of these cities covered by the canvass yielded 141 new cases, with an estimate of 1,211 cases in the total population of these cities. The actual number of cases reported to the health departments was 789 which would indicate that 65 percent of the cases were reported. This figure may be compared with 62 percent found in the name check.

Adding the 2 areas, the estimate for the whole population of all 32 large cities was 4,161 new poliomyelitis cases, of which 3,588 or 86 percent were reported to the health departments, as compared with 74 percent found by the name check.

No data are available as to whether the reported cases were paralytic or nonparalytic, so no separate estimate can be made for paralytic cases. However, in the check of names the proportion of nonparalytic cases that was reported to health departments in the epidemic Northeast was 91 percent as compared with 75 percent for paralytic cases. In the other (nonepidemic) regions the few nonparalytic cases recorded in the family surveys were less frequently reported to health departments than was true of paralytic cases.

The figure of 75 percent of paralytic cases being reported to health departments in the large northeastern cities, as determined by a name check on this survey for 1935, may be compared with the finding of Nelson and Aycock *(10)* of 77 percent of paralytic cases in Massachusetts being reported to health departments. That study was based on a similar name check of 2,263 paralytic cases that were treated by the Harvard Infantile Paralysis Commission during the period 1928–41. In the 2 epidemic years of 1931 and 1935, 82 percent of the cases were reported, as compared with 69 percent for definitely nonepidemic years, and 73 percent for the intermediate year of 1930.

The fact that there is more complete reporting when the disease is epidemic is confirmed by other data. Considering all reported cases and all recorded deaths in the United States for each year from 1930 to 1944, as shown in table 1, it is found that the cases per death are generally higher in epidemic years. In 1935 and 1943 when case rates were exceptionally high and in 1941 when they were moderately high, there were 11 cases per death. However, the case incidence was also high in 1931 but there were only 8 cases per death. In 1938 when the case incidence was very low, there were only 4 cases per

death. In 1932, 1936, and 1942 when the case incidence was moderately low, there were 4, 6, and 8 reported cases per death, respectively.

In the epidemic year of 1935 the New England and Middle Atlantic sections, where the disease was definitely epidemic, both reported 18 cases per death, as compared with 10 or less for each of the other 7 regions, with 2 of these sections reporting only 2 to 3 cases per death. But in 1938 with the exceptionally low case rate, the Pacific section with only 6 cases per death was the highest; in the New England, Middle Atlantic, and East North Central sections there were about 5 cases per death; in the West North Central and South Atlantic there were 4 cases per death; and in the South Central and Mountain regions there were 2 to 3 cases per death. Thus, in the epidemic year of 1935, there were 18 cases per death in the sections with active epidemics and 2 to 5 cases per death in the regions most removed from the center of the outbreak. In the low year of 1938, there were only 5 to 6 cases per death in the most densely populated regions. The fact that incompleteness of reporting tends to increase with distance from the center of the epidemic suggests that a considerable part of the underreporting may be due to nonrecognition of the disease rather than to nonreporting of diagnosed cases.

Severity of cases.—Incomplete reporting of cases is reflected in abnormally high apparent case fatality rates. Relating the registered deaths in 1935 in the 32 large surveyed cities to the reported cases, the indicated fatality is 5.0 percent, with 4.2 in the epidemic Northeast and 8.0 in other sections. If the reported cases are corrected for underreporting by the method described above, the case fatalities approach the rates for the survey, 4.3 for the total of the 32 cities with 4.0 for the Northeast and 5.0 for the other regions. These fatalities are based on an estimated 4,161 cases and 180 registered deaths in these cities, excluding deaths of nonresidents where possible.

Among the 424 cases of poliomyelitis that occurred in the white canvassed population during the study year, there were 16 deaths or a case fatality of 3.8 percent. Among the 350 cases among children under 15 years of age there were 12 deaths, or 3.4 percent fatal, as compared with 4 deaths among the 74 cases that were 15 years or over, a fatality of 5.4 percent. In the Northeast where 266 cases occurred, the fatality was 3.4 percent, with 3.0 for children under 15 years and 6.2 for persons 15 and over. In the other geographic sections there were 7 deaths among the 158 cases of all ages, a fatality of 4.4 percent as compared with 3.4 in the epidemic region. Even these fatalities may be high, for if cases are unrecognized, the family is unable to report them in the household canvass, with a resulting higher apparent case fatality.

Although the numbers of deaths are too small for reliable rates, it may be worth while to consider several sets of data on the severity of the disease in the 2 sexes. The few deaths among the cases recorded in the survey indicate lower case fatality rates for girls than boys, but the difference is not statistically significant. Among the 200 cases of white males under 15 years of age there were 10 deaths, or 5.0 percent; among the 150 cases of white females of those ages there were 2 deaths, or 1.3 percent fatal.

Fatality rates may be computed from the data on the history of poliomyelitis at any time since birth (table 13). Fatal cases in these data for males who were, or if living would have been, under 25 years of age at the time of the survey amounted to 9.6 percent of the cases, as compared with 8.3 for females; the corresponding fatality rates for paralytic cases were 13.0 percent for males and 11.0 for females.

TABLE 13.—*Types of poliomyelitis histories occurring at any time since birth among persons of specific ages—children of native white parents*[1] *in 28 surveyed cities, 1935–36*

	Ages[2] as of survey year										
	All under 25			All under 15			Both sexes				
	Both sexes	Male	Female	Both sexes	Male	Female	Under 5	5–9	10–14	15–19	20–24
Number of all poliomyelitis cases	897	449	448	441	215	226	42	156	243	233	223
Number of paralytic cases	668	332	336	313	150	163	32	103	178	187	168
Percent of all cases that were paralytic	74.5	73.9	75.0	71.0	69.8	72.1	76.2	66.0	73.3	80.3	75.3
Number of paralytic cases with residual effects or death	494	253	241	232	118	114	23	71	138	132	130
Percent of all paralytic cases with residual effects or death	74.0	76.2	71.7	74.1	78.7	69.9	71.9	68.9	77.5	70.6	77.4
Number of nonfatal paralytic cases	588	289	299	286	137	149	29	95	162	166	136
Number of nonfatal paralytic cases with residual effects	414	210	204	205	105	100	20	62	123	111	98
Percent of nonfatal paralytic cases with residual effects	70.4	72.7	68.2	71.7	76.6	67.1	69.0	65.3	75.9	66.9	72.1
Number of fatal cases	80	43	37	27	13	14	3	8	16	21	32
Percent of all cases that were fatal	8.9	9.6	8.3	6.1	6.0	6.2	7.1	5.1	6.6	9.0	14.3
Percent of all paralytic cases that were fatal	12.0	13.0	11.0	8.6	8.7	8.6	9.4	7.8	9.0	11.2	19.0

[1] Own, step, and adopted children of white native-born household heads.

[2] Ages of living persons are expressed as the attained age (last birthday) at the beginning of the study year. Ages of nonresident and dead persons represent the age they would have attained at the time of the survey. This method is equivalent to classifying all persons according to year of birth—thus, ages 20–24 years (living resident, nonresident, and dead) all represent persons born in the years 1911 to 1915, and ages 10–14 represent children born in the years 1921–25.

Note that this method of counting ages means that data here classified as 20–24 include cases occurring from birth to 24 years of age among persons who were 20–24 years when the study was made; similarly 10–14 includes cases occurring from birth to 14 years of age. Thus these ratios do not pertain to cases occurring at specific ages but to cases among persons who were of the specific ages when the histories were recorded by the survey.

Other measures of the severity of cases also indicate that the disease is somewhat less serious for girls (table 13). Of the histories since birth of paralytic cases among males who were, or if living would have been, under 25 years of age at the time of the survey,

76 percent had some residual paralysis or died from the disease, as compared with 72 percent for girls of those ages. Of the histories since birth of nonfatal paralytic cases among boys under 25 years of age, 73 percent had some residual crippling effects, as compared with 68 percent for girls.

SUMMARY

Poliomyelitis as reported to health departments in the past 15 years shows an epidemic situation in some region of the United States during nearly every year. The periods of exceptionally high incidence usually extended over 2 years in which the western part of the country tends to have high rates in one year and the eastern part in the other. There is great variation in the heights of the peaks in the several geographic sections in terms of cases per 100,000 population. The peak rates tend to occur somewhat earlier in the South than in the North and West. The years 1943 and 1944 both had high rates and in 1945 rather large numbers of cases were reported in most of the geographic sections.

In house-to-house canvasses made a few years ago, family informants (usually mothers) reported that 5.7 per 1,000 living children 15–19 years of age had a history of poliomyelitis at some time since birth. Not all of the reported histories were paralytic; at 15–19 years of age 4.5 per 1,000 living children gave a history of a paralytic attack, and 3.0 per 1,000 had residual paralysis or muscle weakness.

History rates of poliomyelitis were reported as rather consistently higher in Northeast and North Central cities than in the South. Histories of poliomyelitis were exceptionally high in the West but when paralytic cases with residual effects are considered, the West shows lower history rates than the North Central section. Geographic variations in history rates are generally consistent with the data on reported incidence as shown in figure 1.

Data from a family survey on the character of the crippling effects of poliomyelitis indicate that the legs are most frequently affected. Crippling involved the feet or legs in 85 percent of the children under 15 years of age with residuals of poliomyelitis, as compared with 25 percent which involved the hands or arms; in a considerable proportion of the cases both the legs and arms were involved. Involvement of only the fingers or toes was negligible.

The age incidence of poliomyelitis is more similar to that of diphtheria than of scarlet fever or whooping cough. The peak rate in the survey data occurred at 3 years of age, with a fairly regular decline in incidence as age increased. Unlike most diseases, relative variation with age was greater in poliomyelitis case rates than in death rates.

Both incidence and mortality indicate somewhat lower poliomyelitis rates among girls than boys. Measures of the severity of the disease,

such as the proportion of cases that were paralytic, indicate that the disease is slightly less severe in girls than boys. This is the opposite of the showing for diphtheria and is quite different from scarlet fever in which the incidence was practically identical for girls and boys.

Poliomyelitis case and death rates were lower for colored than for white persons living in the same geographic section.

Poliomyelitis death rates in the United States among residents of cities of various sizes indicate that the rate increases as size of city decreases, but rural areas and villages under 2,500 have lower rates than small cities and higher rates than cities of 100,000 and over. This general pattern holds true in the several geographic regions.

Cases recorded in the family survey were checked by name against health department files of reported cases in each of the 28 cities included. Also total cases for whole populations of the surveyed cities were estimated from the canvassed samples and compared with cases reported to the health departments. These two methods indicate that from 74 to 86 percent of poliomyelitis cases were reported to the health departments. In the Northeast where the disease was definitely epidemic during the study year, a higher proportion of the cases was reported than in areas remote from the center of the outbreak.

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REGULAR CORPS APPOINTMENTS FOR MEDICAL OFFICERS IN THE UNITED STATES PUBLIC HEALTH SERVICE

Examinations for appointment in the Regular Corps in grades of assistant surgeon (first lieutenant) and senior assistant surgeon (captain) will be held on the dates listed below.

Regular Corps appointments are permanent in nature and provide unique opportunities to qualified doctors for a life career in one or more of a large number of fields including research, general hospitals, special hospitals, foreign duty, and public health programs. Assignments are made with all possible consideration of the officer's demonstrated abilities and experiences. There is ample opportunity for professional growth and development. Entrance pay for assistant surgeon with dependents is $3,411 a year and for senior assistant surgeon with dependents is $3,991 a year. Promotions are at regular intervals up to and including the grade of medical director which corresponds to full colonel at $7,951 a year. Retirement pay at 64 is $4,500 a year. Full medical care including disability retirement at three-fourths pay is provided. All expenses of official travel are paid by the Government. Thirty days' annual leave with pay is provided.

Examinations will be oral and written. The oral examination will be held at 9 a. m. at the several places listed below on the dates shown. The written examination will be held on May 14, 15, and 16 at places convenient to the candidate and the Service. National Board grades may be used for the assistant surgeon examination.

Applicants for the grade of assistant surgeon must be citizens of the United States, must present diploma of graduation from a recognized medical school, must have had or be in process of completing the seventh year of college or professional training or experience since high-school graduation (2 years premedical, 4 years medicine, 1 year internship), and must have a physical examination at place of oral examination by medical officers of the Service. Applicants for the grade of senior assistant surgeon must meet the above requirements and must have had four additional years of postgraduate training or experience.

Application forms may be obtained by writing to the Surgeon General, U. S. Public Health Service, Washington 25, D. C.

Places and dates of oral examinations are as follows:

Atlanta, Ga.: Malaria Control in War Areas, 605 Volunteer Bldg	April 22
Baltimore, Md.: U. S. Marine Hospital, Wyman Park Drive & 31st St	May 9
Boston, Mass.: U. S. Marine Hospital, 77 Warren St. (Brighton	May 6
Chicago, Ill.: U. S. Marine Hospital, 4141 Clarendon Ave	April 30, May 1
Cleveland, Ohio: U. S. Marine Hospital, Fairhill Road & East 124th St	May 3
Denver, Colo.: 617 Colorado Bldg	April 8
Detroit, Mich.: U. S. Marine Hospital, Windmill Pointe	May 2
Forth Worth, Tex.: U. S. Public Health Service Hospital	April 25
Kirkwood, Mo. (near St. Louis): U. S. Marine Hospital, 525 Couch Ave	April 26, 27
Los Angeles, Calif.: U. S. Public Health Service Relief Station, 406 Federal Bldg	April 9
Minneapolis, Minn.: Office of Indian Affairs, 218 Federal Office Bldg	April 29
New Orleans, La.: U. S. Marine Hospital, 210 State St	April 23, 24
New York, N. Y.: U. S. Marine Hospital, Stapleton, Staten Island	May 7, 8
Norfolk, Va.: U. S. Marine Hospital, Hampton Blvd., Larchmont	May 10
San Francisco, Calif.: U. S. Marine Hospital, 14th Ave. & Park Blvd	April 10, 11
Seattle, Wash.: U. S. Marine Hospital, Judkins St. & 14th Ave. S	April 12, 13
Washington, D. C.: U. S. Public Health Service Dispensary, Fourth and D Streets, S. W	April 4, May 13

REGULAR CORPS APPOINTMENTS FOR DENTAL OFFICERS IN THE UNITED STATES PUBLIC HEALTH SERVICE

A competitive examination for appointment in the Regular Corps in grades of assistant and senior assistant dental surgeon will be held on the dates listed below.

Regular Corps appointments are permanent in nature and provide unique opportunities to qualified dentists for a life career in the various phases of dentistry including public health administration and research. Assignments are made with all possible consideration of the officer's demonstrated abilities and experience.

Examinations will be oral and written. The oral examination will be held at the times and places designated below. The written examination will be held on June 5, 6, and 7, at places convenient to the candidate and the Service.

An applicant for the assistant grade must be a citizen of the United States, must present a diploma of graduation from an accredited dental school, must have had at least 7 years of education (exclusive of high school) and professional training or experience, and must have a physical examination made by a medical officer of the Public Health Service prior to the oral examination.

An applicant for the senior assistant grade must meet the requirements for the assistant grade and must have had an additional 4 years of postgraduate training or experience.

The written examination for the assistant grade will be in: (1) Anatomy and oral surgery; (2) pathology and bacteriology; (3) materia medica and physiology; (4) hygiene and radiology; and (5) operative and prosthetic dentistry. A practical examination consisting of clinical and laboratory demonstrations will be given following the last written examination. A candidate who has passed the examination given by the National Board of Dental Examiners may elect to have his grades used in lieu of taking the written portion of his examination; however, clinical and laboratory demonstrations will be required.

The written examination for the senior assistant grade will be in: (1) Oral surgery; (2) pathology and bacteriology; (3) hygiene; (4) operative dentistry; and (5) prosthetic dentistry. Certificates granted by the National Board of Dental Examiners do not apply to this grade.

Application forms may be obtained by writing to the Surgeon General, U. S. Public Health Service, Washington 25, D. C. (Attention: Dental Division).

Entrance pay for assistant grade with dependents is $3,411 a year and for senior assistant grade with dependents is $3,991 a year. Every 3 years an increase of 5 percent of the base pay is automatic and promotions are at regular intervals up to and including the grade of dental director. Army or Navy service is credited towards longevity pay. Retirement pay at the age of 64 is $4,500 a year. Full medical care, including disability retirement at three-fourths base pay, is provided.

All expenses of official travel are paid by the Government. Thirty days' annual leave with pay is provided.

Oral examinations will be held at 9 a. m. at the following places:

Baltimore, Md.: U. S. Marine Hospital, Wyman Park Dr. & 31st St	April 16
Chicago, Ill.: U. S. Marine Hospital, 4141 Clarendon Ave	June 1
Kirkwood, Mo. (near St. Louis): U. S. Marine Hospital, 525 Couch Ave	May 31
Los Angeles, Calif.: U. S. Public Health Service Relief Station, 406 Federal Bldg	May 21
New Orleans, La.: U. S. Marine Hospital, 210 State St	May 17

New York, N. Y.: U. S. Marine Hospital, Stapleton, Staten Island---- April 17
San Francisco, Calif: U. S. Marine Hospital, 14th Ave. & Park Blvd---- May 23
Seattle, Wash.: U. S. Marine Hospital, Judkins St. & 14th Ave., S---- May 27
Washington, D. C.: U. S. Public Health Service Dispensary, 4th & D Sts., SW---- April 15, June 3

ANNOUNCEMENT OF EXAMINATION FOR APPOINTMENT AS ASSISTANT AND SENIOR ASSISTANT SANITARY ENGINEER (REGULAR CORPS) UNITED STATES PUBLIC HEALTH SERVICE

An examination for appointment as assistant sanitary engineer and senior assistant sanitary engineer in the Regular Commissioned Corps of the United States Public Health Service is scheduled to be held at

Atlanta, Ga.: Malaria Control in War Areas, 605 Volunteer Bldg.- May 15
Chicago, Ill.: U. S. Marine Hospital, 4141 Clarendon Ave---- May 31
Cincinnati, Ohio: U. S. Public Health Service Water & Sanitation Investigation Station, East Third and Kilgour Sts---- April 19
Denver, Colo.: U. S. Public Health Service District Office, 617 Colorado Bldg---- May 29
Los Angeles, Calif.: U. S. Public Health Service Relief Station, 406 Federal Bldg---- May 21
New Orleans, La.: U. S. Marine Hospital, 210 State St---- May 17
New York, N. Y. (Stapleton, Staten Island): U. S. Marine Hospital---- April 17
San Francisco, Calif.: U. S. Marine Hospital, 14th Ave. & Park Blvd---- May 23
Seattle, Wash.: U. S. Marine Hospital, Judkins St. & 14th Ave., S---- May 27
Washington, D. C.: U. S. Public Health Service Dispensary, Fourth and D Sts., SW---- April 15, June 3

The oral, professional, academic, and physical examinations will be held at 9 a. m. at places and dates given above. The final written portion of the examination will be given simultaneously at the above locations beginning on June 5, 1946, and ending on June 7, 1946. The written portion of the examination may be given at certain other stations of the Service where two or more regular commissioned officers are on duty, if request is made by an applicant. The written examination will consist of questions on the following subjects:

Assistant sanitary engineer

1. Chemistry and bacteriology.
2. Mathematics, physics, and hydraulics.
3. Water and sewage treatment.
4. Design and construction of sanitary projects.
5. Industrial hygiene.
6. Sanitary science and public health.

Senior assistant sanitary engineer

1. Chemistry and biology.
2. Hygiene and epidemiology.
3. Design of sanitary projects.
4. Practices relating to water, sewage, and wastes.
5. Public health engineering, general.

REQUIREMENTS

Minimum age.—21.

Education and training.—(1) Assistant: at least 7 years of educational (exclusive of high school) and professional training or experience and a degree in engineering (sanitary engineering course); (2) senior assistant: as above, plus 4 additional years of postgraduate professional training or experience.

Compensation (including allowance for quarters and subsistence).—(1) Assistant: $3,411 with, and $2,975.50 without dependents; (2) senior assistant: $3,991 with, and $3,555.50 without dependents.

The applicant will be required to submit to the Board a recent photograph of himself, and his diploma from the professional school from which he was graduated or a certified copy thereof.

Applicants should address a letter to the Surgeon General, U. S. Public Health Service, Washington 25, D. C., at the earliest practicable date, requesting application blanks. Such letter should include a brief biographical statement relative to professional school or college attended, type of studies pursued, degrees granted, and subsequent training or experience. Applicants of foreign birth must furnish proof of United States citizenship.

Transportation expenses to and from and cost of maintenance at place of examination must be assumed by the candidate.

ANNOUNCEMENT OF EXAMINATIONS FOR THE APPOINTMENT OF NURSES TO THE REGULAR COMMISSIONED CORPS OF THE UNITED STATES PUBLIC HEALTH SERVICE

Examinations for the appointment of nurses to the Regular Commissioned Corps of the United States Public Health Service are announced for March and April, to be held in 15 cities throughout the Nation.

Positions are now open in Marine Hospitals of the Service for nurses in the grades of junior assistant nurse officer, comparable to the rank of Army second lieutenant; assistant nurse officer (first lieutenant); and senior assistant nurse officer (captain). Candidates will be judged on the basis of professional, general, and physical fitness. Positions are also open for nurses in public health nursing and for certain special projects of the Public Health Service.

The examinations may be taken by any registered nurse who is a citizen of the United States and has a diploma from a State accredited school of nursing connected with a hospital maintaining a daily average census of not less than 50 patients and offering experience in medicine, surgery, pediatrics and obstetrics. Nurses with degrees will be given preference. Candidates for assistant nurse officers must have at least 7 years of educational and professional training or experience, exclusive of high school. Senior assistant nurse officers must have completed at least 4 additional years of postgraduate training or experience, 11 years beyond high school.

Salaries in the Commissioned Nurse Corps are the same as for officers of comparable rank in the Army, ranging from $1,800 a year base pay with allowance for rental and subsistence to $2,400 a year base pay for the three grades mentioned. Although appointments are permanent, officers may resign at any time except during a war emergency. Uniforms are now being worn but they will probably be discontinued with the official declaration of the end of hostilities.

Oral examinations will be held at 9 a. m. at the several places listed below on the dates shown. The written examination will be held on May 14, 15, and 16 at places convenient to the candidate and the Service. Physical examinations will be given at the place of oral examination by medical officers of the Service.

The examining board has set up the following schedule:

Baltimore, Md., U. S. Marine Hospital, Wyman Park Drive & 31st St.	March 23
Boston, Mass., U. S. Marine Hospital, 77 Warren St. (Brighton).	March 19
Chicago, Ill., U. S. Marine Hospital, 4141 Clarendon Ave.	March 27
Cleveland, Ohio, U. S. Marine Hospital, Fairhill Road and E. 124th St	April 2
Denver, Colo., 617 Colorado Building	April 9
Detroit, Mich., U. S. Marine Hospital, Windmill Pointe	March 28
Kirkwood, Mo. (near St. Louis); U. S. Marine Hospital, 525 Couch Ave.	March 26
Los Angeles, Calif., U. S. Public Health Service Relief Station, 406 Federal Bldg.	April 11
Minneapolis, Minn.; Office of Indian Affairs, Federal Office Bldg.	March 29
Nashville, Tenn.; Joint University Library, Vanderbilt University	March 25
New Haven, Conn.; Yale University School of Nursing, 310 Cedar St.	March 20
New York, N. Y.; U. S. Marine Hospital, Stapleton, Staten Island	March 21–22
San Francisco, Calif.; U. S. Marine Hospital, 14th Ave. & Park Blvd.	April 12
Seattle, Wash.; U. S. Marine Hospital, Judkins St. & 14th Ave. S.	April 13
Washington, D. C.: U. S. Public Health Service Dispensary, 4th and D Sts., SW	March 18

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 16, 1946

Summary

For the country as a whole, only a slight decrease in the incidence of influenza was recorded for the week. Of the total of 8,411 cases reported, as compared with 8,846 last week and a 5-year median of 5,308, 10 States with reports of more than 200 cases each reported an aggregate of 7,657 cases, or 91 percent of the total. A decline of 1,259 cases in 3 of these States was nearly offset by slight increases in the 7 others. These States are as follows (last week's figures in parentheses): *Increases*—Virginia 937 (827), Tennessee 213 (57), Alabama 569 (317), Arkansas 318 (260), Oklahoma 314 (231), Arizona 203 (164), California 716 (291); *decreases*—South Carolina 961 (1,180), Louisiana 541 (1,279), Texas 2,885 (3,187). Since November 18, 1945, a total of 486,345 cases has been reported, as compared with 46,098 and 620,052, respectively, in the corresponding periods of 1944–45 and 1943–44.

Of a total of 173 reported cases of meningococcus meningitis, as compared with 175 last week and a 5-year median of 281, New York reported 12, Pennsylvania 16, California 19, and Illinois 9. The total to date is 1,468, as compared with a 5-year median of 1,697 (reported for the corresponding period last year).

Of 13,932 cases of measles reported for the week, as compared with 11,260 last week and a 5-year median of 16,334, 6,761 occurred in the Middle Atlantic and East North Central areas. A decrease was reported in New York, but increases occurred in Pennsylvania and Michigan. The total for the year to date is 53,474, as compared with a 5-year median of 80,610, and 11,091 for the same period last year.

Although the cumulative total of 313 cases of poliomyelitis is more than reported for the corresponding period of any of the past 5 years, the total of 33 cases (as compared with 32 last week) is the first weekly increase reported since October 1945.

Of 11 cases of smallpox reported, 6 occurred in the West South Central area.

A total of 10,063 deaths was recorded during the week in 93 large cities of the United States, as compared with 10,211 last week, 9,913 and 9,824, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 10,066. The total for the year to date in these cities is 74,530, as compared with 69,041 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Feb. 16, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945	
NEW ENGLAND												
Maine	5	1	1	4	1	2	14	2	122	1	0	0
New Hampshire	0	1	0	2	------	------	9	------	3	0	0	0
Vermont	2	2	0	17	------	------	6	4	29	0	0	0
Massachusetts	8	5	3	------	------	------	250	98	454	5	7	7
Rhode Island	0	0	1	------	------	------	4	16	16	0	0	0
Connecticut	1	0	0	14	1	4	84	59	282	2	2	2
MIDDLE ATLANTIC												
New York	17	12	15	[1] 18	[1] 2	[1] 7	1,102	55	1,631	12	32	32
New Jersey	7	1	6	12	4	23	425	36	1,076	6	4	5
Pennsylvania	19	12	12	4	3	3	1,998	47	1,174	16	24	21
EAST NORTH CENTRAL												
Ohio	39	8	8	26	9	28	104	20	190	4	18	6
Indiana	17	9	9	34	10	36	340	10	175	4	6	6
Illinois	11	3	15	8	3	19	1,035	60	506	9	18	16
Michigan [2]	13	5	5	2	2	2	1,429	22	249	4	12	5
Wisconsin	4	0	1	90	16	56	328	27	769	5	3	3
WEST NORTH CENTRAL												
Minnesota	7	4	4	------	2	2	48	13	32	7	3	3
Iowa	5	4	4	------	------	3	47	35	148	4	4	1
Missouri	12	6	5	5	4	4	415	15	86	7	10	6
North Dakota	4	1	1	9	20	20	3	3	28	0	3	1
South Dakota	1	3	0	------	1	1	110	21	31	0	0	0
Nebraska	3	5	2	26	50	8	146	15	32	2	0	0
Kansas	6	6	3	13	9	14	746	13	251	4	2	2
SOUTH ATLANTIC												
Delaware	1	0	0	------	------	------	8	7	8	2	0	0
Maryland [2]	16	8	6	14	8	9	113	75	75	2	4	5
District of Columbia	0	3	1	5	1	1	48	7	34	3	5	1
Virginia	10	5	6	937	559	559	257	44	378	4	7	7
West Virginia	7	5	5	10	29	53	37	8	112	2	5	3
North Carolina	8	12	12	------	------	48	254	45	257	2	7	7
South Carolina	2	1	4	961	687	735	122	18	64	3	5	5
Georgia	7	9	4	139	17	164	163	15	248	0	2	1
Florida	3	5	5	11	------	5	42	11	58	2	3	2
EAST SOUTH CENTRAL												
Kentucky	8	14	5	93	10	10	371	6	54	3	14	4
Tennessee	11	5	9	213	101	101	253	65	125	6	7	7
Alabama	5	9	9	569	230	230	250	28	95	1	4	4
Mississippi [2]	4	13	6	------	------	------	------	------	------	3	6	4
WEST SOUTH CENTRAL												
Arkansas	2	7	5	318	145	336	60	17	150	2	10	0
Louisiana	13	16	6	541	7	21	195	24	57	5	3	3
Oklahoma	8	9	4	314	248	248	84	41	41	7	5	1
Texas	35	43	42	2,885	2,043	1,910	442	310	463	7	19	14
MOUNTAIN												
Montana	5	0	6	25	22	22	57	8	168	0	0	0
Idaho	4	0	1	39	------	------	73	2	38	0	1	0
Wyoming	3	0	0	2	------	33	19	2	43	1	0	0
Colorado	1	9	7	83	60	79	191	39	206	1	3	2
New Mexico	2	2	2	2	3	2	45	6	21	0	0	0
Arizona	0	3	5	203	73	166	22	4	21	0	1	0
Utah [2]	0	0	0	19	61	61	219	82	55	2	0	0
Nevada	0	0	0	------	------	------	5	1	2	0	0	0
PACIFIC												
Washington	8	5	4	------	1	8	484	99	99	2	4	4
Oregon	7	0	2	28	7	29	144	57	137	2	1	1
California	31	38	20	716	23	103	1,331	683	621	19	17	17
Total	385	309	283	8,411	4,472	5,308	13,932	2,275	16,334	173	281	281
7 weeks	2,874	2,366	2,186	147,779	30,581	33,080	53,474	11,091	80,610	1,468	1,697	1,697

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Feb 16, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945		Feb. 16, 1946	Feb. 17, 1945	
NEW ENGLAND												
Maine	0	0	0	52	46	19	0	0	0	1	3	1
New Hampshire	0	0	0	9	2	5	0	0	0	0	0	0
Vermont	0	0	0	11	11	13	0	0	0	0	0	0
Massachusetts	0	2	0	178	312	373	0	0	0	2	3	2
Rhode Island	0	0	0	11	32	14	0	0	0	0	0	0
Connecticut	0	0	0	72	91	71	0	0	0	1	1	0
MIDDLE ATLANTIC												
New York	4	14	3	486	540	507	0	0	0	0	4	4
New Jersey	1	0	0	121	139	146	0	0	0	1	2	1
Pennsylvania	1	1	0	337	534	320	0	0	0	0	19	5
EAST NORTH CENTRAL												
Ohio	0	0	0	327	407	365	0	0	0	2	1	2
Indiana	1	1	0	111	224	179	1	1	1	0	2	2
Illinois	0	0	1	218	395	361	0	0	0	4	0	1
Michigan [2]	0	0	1	134	268	218	0	1	1	0	0	1
Wisconsin	0	0	0	130	210	219	0	1	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	1	0	0	41	83	82	0	0	0	0	1	0
Iowa	1	0	0	60	59	75	1	0	1	0	0	0
Missouri	0	2	0	82	203	87	0	1	1	2	1	1
North Dakota	0	1	0	14	23	23	0	0	0	0	2	0
South Dakota	0	0	0	22	12	21	0	0	0	0	0	0
Nebraska	0	0	0	85	88	45	0	0	0	0	0	0
Kansas	0	0	0	91	123	89	0	0	0	0	0	1
SOUTH ATLANTIC												
Delaware	0	0	0	7	17	16	0	0	0	0	0	0
Maryland [2]	0	2	0	83	256	80	0	0	0	0	0	1
District of Columbia	0	0	0	22	67	24	0	0	0	1	0	0
Virginia	0	2	0	53	129	35	0	0	0	2	1	2
West Virginia	0	1	0	47	63	37	0	0	0	1	0	0
North Carolina	1	3	2	51	101	47	0	0	0	2	1	1
South Carolina	0	0	0	8	8	11	0	0	0	0	2	0
Georgia	1	0	0	16	28	21	0	2	0	1	2	2
Florida	5	0	0	7	7	7	0	0	0	7	3	2
EAST SOUTH CENTRAL												
Kentucky	1	0	1	42	88	88	0	0	0	1	0	0
Tennessee	1	0	0	73	96	80	0	0	0	2	2	3
Alabama	1	4	0	29	42	17	0	0	0	1	0	1
Mississippi [2]	1	1	1	16	44	9	1	0	0	0	1	2
WEST SOUTH CENTRAL												
Arkansas	2	0	0	21	24	13	1	8	0	0	2	2
Louisiana	0	0	0	9	18	6	0	0	0	3	2	2
Oklahoma	0	0	0	17	35	27	4	0	0	1	0	1
Texas	0	2	2	97	151	77	1	0	4	4	8	4
MOUNTAIN												
Montana	1	1	0	7	11	37	0	0	0	0	0	0
Idaho	0	0	1	11	69	14	0	0	0	0	0	0
Wyoming	0	0	0	4	5	10	0	0	0	0	0	0
Colorado	0	1	1	42	125	58	2	0	0	0	0	0
New Mexico	0	0	0	15	32	7	0	0	0	0	1	0
Arizona	0	0	0	17	37	11	0	0	0	0	0	0
Utah [2]	0	0	0	23	71	71	0	0	0	0	0	0
Nevada	0	0	0	0	10	0	0	0	0	0	0	0
PACIFIC												
Washington	1	2	1	45	88	57	0	0	0	0	1	0
Oregon	0	0	0	26	40	17	0	0	0	0	0	0
California	9	2	3	235	423	153	0	0	0	3	2	2
Total	33	42	26	3,615	5,887	4,069	11	14	33	42	67	67
7 weeks	313	288	213	21,094	35,958	26,048	50	65	154	281	419	490

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Massachusetts 1; Connecticut 1; New Jersey 1; Texas 1.

Telegraphic morbidity reports from State health officers for the week ended Feb. 16, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended Feb. 16, 1946							
	Week ended—		Median 1941–45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Feb. 16, 1946	Feb. 17, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	17	36	36								
New Hampshire	2										
Vermont	22	27	27								1
Massachusetts	141	142	164	1							
Rhode Island	34	23	16								
Connecticut	50	45	45								1
MIDDLE ATLANTIC											
New York	221	221	332	3	6		1				4
New Jersey	146	76	105			1					
Pennsylvania	150	192	192								
EAST NORTH CENTRAL											
Ohio	79	128	158								
Indiana	14	24	24	1			1				
Illinois	96	47	106	1	1		2	1	1		6
Michigan [2]	97	57	234								3
Wisconsin	51	79	98				1				2
WEST NORTH CENTRAL											
Minnesota	9	32	38	2					1		6
Iowa	4	4	19								
Missouri	14	25	13								
North Dakota	2	1	5								
South Dakota		5	5								
Nebraska	10	15	14				1				
Kansas	17	33	46								5
SOUTH ATLANTIC											
Delaware	3	5	5								
Maryland [3]	12	49	49								
District of Columbia	4	10	10								
Virginia	38	32	56			16			1		1
West Virginia	13	52	40								
North Carolina	42	89	131						1	1	
South Carolina	74	38	51	1	14					1	
Georgia	31	11	14						4	6	2
Florida	9	19	19				2			2	
EAST SOUTH CENTRAL											
Kentucky	8	22	50						1		
Tennessee	41	16	37						7	2	2
Alabama	10	9	9				1		1	5	2
Mississippi [3]									4	1	
WEST SOUTH CENTRAL											
Arkansas	12	20	10	4						1	1
Louisiana	3	31	7	1					2	5	
Oklahoma	1	4	9								2
Texas	146	313	313	11	192	56			1	23	14
MOUNTAIN											
Montana	6	20	15						1		
Idaho	18		5								
Wyoming		5	3								
Colorado	28	31	31		3						
New Mexico	6	9	14								
Arizona	16	25	25			22					
Utah [3]	37	10	17								
Nevada											
PACIFIC											
Washington	37	32	49								2
Oregon	21	16	16	1							2
California	97	245	245	4	4			1		2	3
Total	1,889	2,325	3,623	30	220	95	9	2	25	49	59
Same week, 1945	2,325			17	397	73	8	1	8	39	77
Average, 1943–45	2,522			19	250	52	9	[4] 0	9	[4] 32	
7 weeks: 1946	12,814			273	2,239	873	54	3	155	386	451
1945	16,017			192	4,313	957	42	3	176	425	510
Average, 1943–45	18,571		[4] 27,046	155	2,354	532	57	[4] 3	129	[4] 341	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 9, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	1	0	0	0	4	0	0	11
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	2	0	0	------
Vermont:												
Barre	0	0	------	0	------	1	0	0	6	0	0	------
Massachusetts:												
Boston	4	0	------	2	30	3	19	0	42	0	0	38
Fall River	0	0	------	0	------	0	1	0	3	0	0	7
Springfield	0	0	------	0	------	0	0	0	5	0	0	1
Worchester	0	0	------	0	11	1	13	0	5	0	0	9
Rhode Island:												
Providence	0	0	------	0	1	2	5	0	2	0	0	44
Connecticut:												
Bridgeport	0	0	------	0	------	0	0	0	3	0	0	2
Hartford	0	0	------	0	------	1	1	0	3	0	0	3
New Haven	0	0	1	0	1	0	1	0	0	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	------	0	30	1	7	0	9	0	0	37
New York	15	2	15	2	295	9	90	1	242	0	0	43
Rochester	0	0	------	1	44	0	3	0	6	0	0	1
Syracuse	0	0	------	0	473	0	2	0	11	0	0	6
New Jersey:												
Camden	0	0	------	0	11	0	1	0	4	0	0	2
Newark	0	0	2	0	89	1	3	0	8	0	0	15
Trenton	0	0	------	0	------	0	8	0	1	0	0	------
Pennsylvania:												
Philadelphia	4	0	2	2	488	5	21	1	52	0	0	34
Pittsburgh	2	0	5	4	2	5	10	0	15	0	0	11
Reading	0	0	------	1	17	0	3	0	2	0	0	14
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	5	0	2	1	33	10	10	0	14	0	0	4
Cleveland	0	0	11	1	7	2	8	0	22	0	0	19
Columbus	9	0	------	0	7	1	1	0	8	0	0	3
Indiana:												
Fort Wayne	0	0	------	1	------	0	2	0	0	0	0	------
Indianapolis	1	0	------	0	121	2	6	0	32	0	0	17
South Bend	0	0	------	0	------	0	0	0	3	0	0	------
Terre Haute	0	0	------	0	1	0	3	0	4	0	0	------
Illinois:												
Chicago	1	0	5	2	706	2	23	0	85	0	2	62
Springfield	1	0	------	0	------	1	3	0	3	0	0	------
Michigan:												
Detroit	9	0	3	0	685	0	10	0	46	0	0	51
Flint	0	0	------	0	18	0	3	0	2	0	0	------
Grand Rapids	0	0	------	0	56	0	0	0	3	0	0	10
Wisconsin:												
Kenosha	0	0	------	0	4	0	0	0	0	0	0	------
Milwaukee	0	0	1	1	82	0	3	0	33	0	0	13
Racine	0	0	------	0	1	0	1	0	2	0	0	------
Superior	0	0	------	0	2	0	0	0	3	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	9	0	------	0	4	0	0	0	2	0	0	3
Minneapolis	6	0	------	0	2	0	4	0	10	0	0	1
Missouri:												
Kansas City	1	0	5	0	168	0	16	0	12	0	0	------
St. Louis	6	0	4	1	31	3	12	0	20	0	1	1

City reports for week ended Feb. 15, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0		0		0	0	0	3	0	0	
Nebraska:												
Omaha	1	0		0	15	1	2	0	9	0	0	
Kansas:												
Topeka	0	0		0	93	0	0	0	10	0	0	
Wichita	3	0		0	42	0	4	0	6	0	0	
SOUTH ATLANTIC												
Delaware												
Wilmington	0	0		0	5	0	2	0	0	0	0	
Maryland:												
Baltimore	12	1	6	2	44	0	8	1	23	0	0	18
Cumberland	0	0		0	0	0	1	0	0	0	0	
Frederick	0	0		0		0	0	0	0	0	0	
District of Columbia:												
Washington	0	0	4	2	25	1	14	0	14	0	0	3
Virginia												
Lynchburg	0	0		0	3	0	2	0	3	0	0	
Richmond	0	0	22	0	3	1	3	0	8	0	0	1
Roanoke	0	0		0		0	0	0	1	0	0	
West Virginia:												
Wheeling	0	0		0		0	1	0	1	0	0	3
North Carolina:												
Raleigh	1	0		0	17	2	4	0	0	0	0	1
Wilmington	1	0		0		0	1	0	1	0	0	2
Winston-Salem	0	0		0		0	1	0	1	0	0	10
South Carolina:												
Charleston	0	0	34	0		2	0	0	1	0	0	1
Georgia:												
Atlanta	0	0	36	2	3	0	4	0	1	0	0	
Brunswick	0	0		0		0	1	0	0	0	0	
Savannah	0	0	5	2		0	2	1	0	0	0	
Florida:												
Tampa	1	0		0	15	0	2	0	3	0	0	15
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	10	2	31	1	6	0	3	0	0	4
Nashville	0	0		0	15	1	3	0	1	0	0	1
Alabama:												
Birmingham	2	0	3	0	1	0	6	0	0	0	0	
Mobile	2	0	3	3		4	2	0	0	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	37	0	6	1	3	0	5	0	0	1
Louisiana:												
New Orleans	1	0	11	6	5	3	9	1	5	0	1	
Shreveport	0	0		1		0	3	0	0	0	0	
Texas.												
Dallas	0	0	3	4	0	0	3	0	5	0	0	
Galveston	0	0		0		0	3	0	0	0	0	2
Houston	1	0		0	1	0	5	0	3	0	0	
San Antonio	1	0	4	1	10	0	4	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0		0		0	1	0	0	0	0	
Great Falls	0	0		0		0	3	0	0	0	0	
Helena	0	0		0		0	0	0	0	0	0	
Missoula	0	0	25	0	45	0	0	0	1	0	0	
Idaho:												
Boise	0	0		0		0	1	0	0	0	0	
Colorado:												
Denver	2	0	8	0	14	0	12	0	17	0	0	6
Pueblo	0	0		0		0	0	0	5	0	0	3
Utah:												
Salt Lake City	0	0		3	10	0	1	0	3	0	0	4

City reports for week ended Feb. 9, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	3	0	------	0	147	0	3	0	4	0	0	6
Spokane	0	0	------	0	62	0	4	0	3	0	0	16
Tacoma	1	0	------	0	24	0	0	0	0	0	0	5
California:												
Los Angeles	7	0	58	7	90	1	7	1	50	0	0	16
Sacramento	0	0	1	1	12	1	5	0	2	0	0	2
San Francisco	0	0	5	1	136	1	12	0	15	0	0	3
Total	113	3	331	56	4,290	70	441	6	937	0	4	590
Corresponding week, 1945	67	------	105	41	347	------	486	------	1,666	1	18	556
Average, 1941–45	69	------	965	[1] 57	[2] 3,772	------	[1] 524	------	1,487	2	13	829

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Anthrax.—Cases: Philadelphia, 1.
Dysentery, amebic.—Cases: New York, 2; Rochester, 1.
Dysentery, bacillary.—Cases: Charleston, S. C., 3; San Francisco, 1.
Dysentery, unspecified.—Cases: Cincinnati, 1; Mobile, 1; San Antonio, 7.
Leprosy.—Cases: Los Angeles, 1.
Tularemia.—Cases: Memphis, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: Nashville, 1; Shreveport, 1; Houston, 3.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 33,974,200)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	10.5	0.0	2.6	5.2	115	20.9	104.6	0.0	196	0.0	0.0	306
Middle Atlantic	10.2	0.9	11.1	4.6	671	9.7	68.5	0.9	162	0.0	0.0	75
East North Central	15.8	0.0	13.4	3.6	1,048	10.9	44.4	0.0	158	0.0	1.2	110
West North Central	59.5	0.0	20.6	2.3	801	9.2	87.0	0.0	165	0.0	2.3	11
South Atlantic	25.1	1.7	179.2	13.4	193	10.0	77.0	3.3	95	0.0	0.0	90
East South Central	23.6	0.0	94.4	29.5	277	35.4	100.3	0.0	24	0.0	0.0	30
West South Central	8.6	0.0	157.8	34.4	63	11.5	86.1	2.9	55	0.0	2.9	11
Mountain	15.9	0.0	262.1	23.8	548	0.0	143.0	0.0	207	0.0	0.0	103
Pacific	17.4	0.0	101.2	14.2	745	4.7	49.0	1.6	117	0.0	0.0	76
Total	17.4	0.5	50.9	8.6	660	10.8	67.9	0.9	144	0.0	0.6	91

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 19, 1946.—During the week ended January 19, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		26		119	503	30	41	60	160	939
Diphtheria		4	2	24	17	4				51
Dysentery, bacillary				2						2
German measles				4	35		1	6	4	50
Influenza		247			206				67	520
Measles		23	2	232	1,124	4	5	18	44	1,452
Meningitis, meningococcus				4	1	1		1		7
Mumps				37	135	34	6	59	68	339
Poliomyelitis				1						1
Scarlet fever		7	13	73	84	7	1	29	22	236
Tuberculosis (all forms)		3	8	96	54	10		20	39	230
Typhoid and paratyphoid fever				5	1					6
Undulant fever				1		1				2
Venereal diseases:										
Gonorrhea	1	13	16	166	169	49	30	55	100	599
Syphilis		5	7	158	151	12	11	11	49	404
Whooping cough				135	23	1				159

CHINA

Notifiable diseases—September 1945.—During the month of September 1945, certain notifiable diseases were reported in China as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	20	4	Relapsing fever	391	9
Cholera	1,939	394	Scarlet fever	19	2
Diphtheria	21	4	Smallpox	47	2
Dysentery	3,521	75	Typhoid fever	492	7
Plague	126	65	Typhus fever	175	

NORWAY

Notifiable diseases—October 1945.—During the month of October 1945, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	8	Mumps	63
Diphtheria	570	Paratyphoid fever	2
Dysentery, unspecified	21	Pneumonia (all forms)	1,748
Encephalitis, epidemic	6	Poliomyelitis	181
Erysipelas	617	Rheumatism	195
Gastroenteritis	5,435	Scabies	8,036
Gonorrhea	750	Scarlet fever	549
Hepatitis, epidemic	1,391	Syphilis	101
Impetigo contagiosa	5,825	Tuberculosis (all forms)	406
Influenza	2,115	Typhoid fever	12
Laryngitis	11,158	Undulant fever	1
Lymphogranuloma inguinale	1	Weil's disease	3
Malaria	1	Whooping cough	3,031
Measles	8,316		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Bolivia—Santa Cruz Department—Vallegrande Province.—For the week ended February 9, 1946, 12 cases of plague with 4 deaths were reported in Vallegrande Province, Santa Cruz Department, Bolivia.

India—Calcutta.—For the week ended February 2, 1946, 1 death from plague was reported in Calcutta, India. All necessary precautions are being taken.

Smallpox

Canada—Saskatchewan Province.—For the week ended February 2, 1946, 2 cases of smallpox were reported in Saskatchewan Province, Canada.

Morocco (French).—For the period January 21–31, 1946, 170 cases of smallpox were reported in French Morocco.

Typhus Fever

Chile.—For the period December 1–29, 1945, 51 cases of typhus fever were reported in Chile. Provinces reporting the highest incidence are: Valparaiso, 8; Cautin, 3.

Colombia—Department of Cundinamarca—Bogota.—For the month of December 1945, 74 cases of typhus fever with 3 deaths were reported in Bogota, Department of Cundinamarca, Colombia.

Egypt.—For the week ended January 12, 1946, 67 cases of typhus fever were reported in all of Egypt.

Morocco (French).—For the period January 21–31, 1946, 152 cases of typhus fever were reported in French Morocco. Regions reporting the highest incidence are: Agadir and Frontier districts, 14; Casablanca, 53; Fez, 27; Marrakech, 29; Meknes, 16; Rabat, 13.

Turkey.—For the week ended February 9, 1946, 50 cases of typhus fever were reported in Turkey, including 9 cases reported in Istanbul, 5 cases in Izmir, 3 cases in Erzurum, 2 cases in Antalya, and 1 case in Samsun.

Yellow Fever

French Equatorial Africa—Chad Territory—Logone Department—Moundou.—On February 10, 1946, 1 fatal case of suspected yellow fever was reported in a native in Moundou, Logone Department, Chad Territory, French Equatorial Africa.

Venezuela.—During the week ended February 9, 1946, yellow fever was reported in Venezuela as follows: Las Guabinas, jurisdiction of San Felix, municipality of Rivas Berti, Tachira State, 1 case; Vega Grande Farm, municipality of Motatan, Trujillo State, 1 case.

DEATHS DURING WEEK ENDED FEBRUARY 9, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 9, 1946	Corresponding week, 1945
Data for 91 large cities of the United States:		
Total deaths	10,072	9,820
Average for 3 prior years	9,638	
Total deaths, first 6 weeks of year	63,490	58,238
Deaths under 1 year of age	608	639
Average for 3 prior years	634	
Deaths under 1 year of age, first 6 weeks of year	3,575	3,740
Data from industrial insurance companies:		
Policies in force	67,159,950	67,011,370
Number of death claims	14,323	14,452
Death claims per 1,000 policies in force, annual rate	11.1	11.2
Death claims per 1,000 policies, first 6 weeks of year, annual rate	11.7	10.8

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Public Health Methods, pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

VOLUME 61 MARCH 15, 1946 NUMBER 11

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Public Health Reports

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PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS, 1946

FEDERAL SECURITY AGENCY,
UNITED STATES PUBLIC HEALTH SERVICE,
Washington, D. C., February 6, 1946.

The standards included herein have been promulgated as Regulations of the United States Public Health Service and published in the Federal Register. These standards supersede the standards adopted September 25, 1942, and recommended by the Advisory Committee on the Revision of the 1925 Drinking Water Standards. They are recommended and approved by the same Advisory Committee.

Effective upon their date of publication in the Federal Register, these regulations represent standards to which drinking water and water supply systems used by carriers and others subject to Federal Quarantine regulations must conform. These standards are in a form believed suitable for use generally in evaluating quality and safety of water and water supply systems.

[S] THOMAS PARRAN,
Surgeon General, United States Public Health Service.
[S] MAURICE COLLINS
Acting Administrator, Federal Security Agency.

RESOLUTION—ACCEPTANCE OF DRINKING WATER STANDARDS [1]

Whereas the officers and directors of the American Water Works Association are desirous of supporting all efforts to promote better health through safe water supplies; and

Whereas it is noted that the Standards of the United States Public Health Service are promulgated by the Surgeon General for use in the administration of the Interstate Quarantine Regulations, and that they are intended to apply only to water used on common carriers engaged in interstate commerce; and

Whereas it does not appear that the Surgeon General desires or proposes to extend the authority of the United States Public Health Service to include any water supplies other than those used by common carriers subject to Federal Quarantine Regulations; and

Whereas it is the desire of the American Water Works Association to have available for reference, to recognize and to accept, fair and effective standards for quality of water furnished by all public supply systems; and

Whereas the officers and directors of the American Water Works Association have studied the text of the proposed 1946 Drinking Water Standards which have been developed by the Surgeon General of the United States Public Health

[1] Resolution passed by the officers and directors of the American Water Works Association at a meeting of the Board of Directors held January 14-15, 1946.

Service and found the terms and conditions of these Standards to be constructive; and

Whereas it is the earnest hope of the American Water Works Association that, as a result of its voluntary acceptance of the Drinking Water Standards as criteria of quality for all public water supplies in the United States, the State boards of health and their sanitary engineering personnel will find it possible to further constructive and cooperative relationships with the water works management to the ends that deficiencies in water supply systems be corrected as promptly as feasible; that extraneous sources of contamination of water be eliminated; and that encouragement be given to training and employment of qualified personnel in positions of responsibility in the operation of water works: Now therefore be it

Resolved by the officers and directors, acting for the American Water Works Association, That the 1946 Drinking Water Standards proposed for adoption by the United States Public Health Service be voluntarily accepted by our Association as the Standards for all public water supplies.

PREFACE TO THE 1942 EDITION

The following preface to the 1942 edition of the Public Health Service Drinking Water Standards is included, partly from the standpoint of historical interest, but primarily because the basic ideas expressed in the statement of the Advisory Committee included therein are still valid.

REPORT OF THE ADVISORY COMMITTEE ON OFFICIAL WATER STANDARDS

The requirements for drinking (and culinary) water provided by common carriers for the use of passengers carried in interstate traffic, commonly known as the Treasury Department Drinking Water Standards, were last revised in 1925, and published in the Public Health Reports of April 10 of that year. Since that time many improvements in water supply practice have been adopted with resulting increased uniformity of quality and safety to the consumer. Moreover, the Public Health Service, in recent years, has been requested by the American Public Health Association, the American Water Works Association, and the American Chemical Society to review the 1925 Standards. Accordingly, the Public Health Service has undertaken a revision of the Standards in order to have them conform more closely to current requirements for water supplies of attainable safety and potability.

To carry out such a revision the Surgeon General of the Public Health Service, on February 27, 1941, appointed the undersigned special Advisory Committee composed of representatives of various Federal organizations and scientific associations and including several members at large. A smaller subcommittee of Public Health Service officers was designated to prepare tentative suggestions for the consideration of the Advisory Committee.

After thorough consideration, the Advisory Committee recommends the adoption of the revisions as set forth in the text herewith submitted. The principal changes now proposed are:

(1) A distinct separation of the text into: (*a*) That portion containing a statement of the Standards, and (*b*) that portion constituting a recommended manual of water works practice representing the judgment of the technical subcommittee composed of officers of the Public Health Service. This portion of the text is intended to serve as a guide to the reporting agency and should not be considered as indicating additional requirements to be met for certification of the water supply.

(2) In the bacteriological section, the use of 5–10-ml. portions or of 5–100-ml. portions is made optional; a minimum number of samples is to be examined monthly, the number depending upon the population served; the laboratories in which bacteriological examinations are made and the methods used in making them are subject to inspection at any time by the designated representative of the certifying authority.

(3) Concentration limits for lead, fluoride, arsenic, and selenium are included as part of the Standards and their presence in excess of the limits stated shall constitute ground for rejection of the supply. Limits in concentration that should not be exceeded, where other more suitable supplies are available, are given for copper, iron and manganese together, magnesium, zinc, chloride, sulfate, phenolic compounds, total solids, and alkalinity.

(4) The results of recent studies on the potential pollutional hazards existing in the water supply systems of our communities due to faulty plumbing practices, cross-connections, interconnections, etc., as well as the pollutional hazards which are due to faulty water plant and distribution system operational practices, any or all of which may jeopardize the safety of the water in the distribution system, have been adjudged as being of prime importance in the consideration of the requirements of these Standards. The utmost care and consideration have been given to the inclusion of those provisions which would serve to detect possible contamination arising in the distribution system and thus lead to its correction and further safeguarding of the traveling public.

The Committee believes that, in general, water supplies to be eligible for certification should meet all (sanitary, chemical, and bacteriological) requirements of the Standards and that definite failure to meet any one of them should be ground for rejection or provisional certification, according to the judgment of the certifying authority. However, it is realized that the statement of an official standard of drinking water quality, to be generally applicable, must be interpreted reasonably. The Committee has attempted to take into consideration all aspects of the problem and offers these Standards with the recommendation that the judgment and discretion of the certifying authority be exercised in their application.

REPORT OF THE ADVISORY COMMITTEE ON OFFICIAL WATER STANDARDS

Experience gained by the Certifying Authority during three years' utilization of the Standards adopted in 1942 indicates a need for revision of wording and clarification of certain sections of these Standards. During the period these Standards were in effect it became necessary to issue State Health Officers' Circular Letter No. 85 in order that the Standards would be properly and uniformly applied. It is believed desirable to have the Standards worded in such a manner that they are suitable for utilization without further clarification.

Heretofore drinking water standards adopted by the Public Health Service have been designed to apply specifically to those water supplies used by carriers subject to the Interstate Quarantine Regulations. The present revision contemplates a standard for water quality generally acceptable and applicable to all public water supplies in the United States.

It has been with these two objectives in mind that this revision of the Standards has been effected. No major changes have been made in the basic requirements of the Standards, but certain requirements have been restated in such a manner as to make them more readily applicable to existing water supplies. In writing these Standards in a manner that will allow their application to all public water supplies, no inference is meant or desired that the authority of the Public Health Service should be extended to include any water supplies other than those used by carriers subject to the Federal Quarantine Regulations.

It will be noted that the Manual of Recommended Water Sanitation Practice referred to in the Preface to the 1942 edition of the Standards has not been included in this edition. While this manual was intended merely as an advisory guide, in practice it was found that it, at times, was being used as a part of the Standards and for this reason is omitted from the present text.

MEMBERSHIP OF ADVISORY COMMITTEE ON REVISION OF THE DRINKING WATER STANDARDS[1]

Joseph W. Mountin, *Chairman, Assistant Surgeon General, States Relations Division, U. S. Public Health Service, Washington, D. C.*

J. K. Hoskins, *Secretary, Senior Sanitary Engineer, Chief, Sanitation Section, U. S. Public Health Service, Washington, D. C.*

REPRESENTATIVES OF FEDERAL ORGANIZATIONS

Food and Drug Administration: J. W. Sale, Senior Chemist, Food Division, Federal Security Agency, Washington, D. C.

U. S. Geological Survey: W. D. Collins, Chemist in Charge, Quality of Water Division, Department of the Interior, Washington, D. C.

REPRESENTATIVES OF SCIENTIFIC ASSOCIATIONS

American Chemical Society: A. M. Buswell, Chief, Illinois State Water Survey Division, Urbana, Ill.

American Public Health Association: Abel Wolman, Professor of Sanitary Engineering, Johns Hopkins University, Baltimore, Md.

American Society of Civil Engineers: Arthur E. Gorman, Engineer of Water Purification, Bureau of Engineering, Department of Public Works, Chicago, Ill.

American Water Works Association: Charles R. Cox, Chief, Bureau of Water Supply, State Department of Health, Albany, N. Y.

Association of American Railroads: R. C. Bardwell, Superintendent, Water Supply, Chesapeake and Ohio Railroad, Richmond, Va.

Conference of State Sanitary Engineers: Arthur D. Weston, Director and Chief Engineer, Division of Sanitary Engineering, State Department of Health, Boston, Mass.

Society of American Bacteriologists: A. C. Hunter, Principal Bacteriologist, Food and Drug Administration, Federal Security Agency, Washington, D. C.

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Herman G. Baity, Professor of Sanitary Engineering, University of North Carolina, Chapel Hill, N. C.

R. E. Buchanan, Director, Agricultural Experiment Station, Iowa State College, Ames, Iowa.

R. F. Goudey, Sanitary Engineer, Bureau of Water Works and Supply, Los Angeles, Calif.

Technical Subcommittee, Officers of the Public Health Service

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C. C. Ruchhoft, Principal Chemist, Stream Pollution Investigations, Cincinnati, Ohio.

Lawrence T. Fairhall, Principal Industrial Toxicologist, National Institute of Health, Bethesda, Md.

[1] Official positions indicated are as of February 27, 1941, when the Committee was organized.

PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS

Standards Promulgated by the United States Public Health Service, Federal Security Agency, February 5, 1946, for Drinking and Culinary Water Supplied by Carriers Subject to the Federal Quarantine Regulations

(Superseding standards adopted September 25, 1942)[1]

For the purpose of these Standards the terms designated herein below shall be defined as follows:

1.1. *Adequate protection by natural agencies* implies various relative degrees of protection against the effects of pollution in surface waters; dilution, storage, sedimentation, the effects of sunlight and aeration, and the associated physical and biological processes which tend to produce natural purification; and, in the case of ground waters, storage in and percolation through the water-bearing material.

1.2. *Artificial treatment* includes the various processes commonly used in water treatment, both separately and in combination, such as storage, aeration, sedimentation, coagulation, rapid or slow sand filtration, chlorination, and other accepted forms of disinfection. Rapid sand filtration treatment is commonly understood to include those auxiliary measures, notably coagulation and sedimentation, which are essential to its proper operation.

1.3. *Adequate protection by artificial treatment* implies that the method and degree of elaboration of treatment are appropriate to the source of supply; that the works are of adequate capacity to support maximum demands, are well located, designed, and contructed, are carefully and skillfully operated and supervised by properly trained and qualified personnel, and are adequately protected against floods and other sources of pollution. The evidence that the protection thus afforded is adequate must be furnished by frequent bacteriological examinations and other appropriate analyses showing that the purified water is of good and reasonably uniform quality, a recognized principle being that irregularity in quality is an indication of potential danger. A minimum specification of good quality would be conformance to the bacteriological and chemical requirements of these Standards, as indicated in sections 3 and 4.

1.4. *Sanitary defect* means any faulty structural condition, whether of location, design, or construction of collection, treatment, or distribution works which may regularly or occasionally prevent satisfactory purification of the water supply or cause it to be contaminated from extraneous sources. Among the extraneous sources of contamination

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[1] Pub. Health Rep., 58: 69-111 (Jan. 15, 1943).

* The section numbering employed throughout this text differs from that used in the Federal Register, but maintains a parallel with the numbering of the 1942 Standards with which those in the water works field are familiar.

of water supply are dual supplies, bypasses, cross-connections, interconnections, and backflow connections.

1.5. *Health hazard* means any faulty operating condition including any device or water treatment practice, which, when introduced into the water supply system, creates or may create a danger to the well-being of the consumer.

1.6. *Water supply system* includes the works and auxiliaries for collection, treatment, and distribution of the water from the source of supply to the free-flowing outlet of the ultimate consumer.

1.7. *The coliform group of bacteria* is defined, for the purpose of these Standards, as including all organisms considered in the coli-aerogenes group as set forth in the Standard Methods for the Examination of Water and Sewage, current edition, prepared, approved, and published jointly by the American Public Health Association and the American Water Works Association, New York City. The procedures [2] for the demonstration of bacteria of this group shall be those specified herein, for:

(*a*) The completed test, or

(*b*) The confirmed test when the liquid confirmatory medium brilliant green bile lactose broth, 2 percent, is used, providing the formation of gas in any amount in this medium during 48 hours of incubation at 37° C. is considered to constitute a positive confirmed test, or

(*c*) The confirmed test when one of the following liquid confirmatory media is used: Crystal violet lactose broth, fuchsin lactose broth, or formate ricinoleate broth. For the purpose of this test, all are equivalent, but it is recommended that the laboratory worker base his selection of any one of these confirmatory media upon correlation of the confirmed results thus obtained with a series of completed tests, and that he select for use the liquid confirmatory medium yielding results most nearly agreeing with the results of the completed test. The incubation period for the selected liquid confirmatory medium shall be 48 hours at 37° C. and the formation of gas in any amount during this time shall be considered to constitute a positive confirmed test.

1.8. *The standard portion of water* for the application of the bacteriological test may be either:

(*a*) Ten milliliters (10 ml.) or

(*b*) One hundred milliliters (100 ml.)

1.9. *The standard sample* for the bacteriological test shall consist of five (5) standard portions of either:

(*a*) Ten milliliters (10 ml.) or

(*b*) One hundred milliliters (100 ml.) each.

[2] This reference shall apply to all details of technique in the bacteriological examination, including the selection and preparation of apparatus and media, the collection and handling of samples, and the intervals and conditions of storage allowable between collection and examination of the water sample.

In any disinfected supply the sample must be freed of any disinfecting agent within twenty (20) minutes of the time of its collection.[3]

1.10. *The certifying authority* is the Surgeon General of the United States Public Health Service or his duly authorized and designated representatives. Reference to the certifying authority shall be applicable only in the cases of those water supplies to be certified for use on carriers subject to the Federal Quarantine Regulations. *The reporting agency* shall be understood to mean the respective official State health agencies or their designated representatives.

2. AS TO SOURCE AND PROTECTION

2.1. The water supply shall be:

(*a*) Obtained from a source free from pollution; or

(*b*) Obtained from a source adequately purified by natural agencies; or

(*c*) Adequately protected by artificial treatment.

2.2. The water supply system in all its parts should be free from sanitary defects and health hazards, and all known sanitary defects and health hazards shall be systematically removed at a rate satisfactory to the reporting agency and to the certifying authority. Approval of public water supplies by the reporting agency and the certifying authority will be conditioned by the existence of:

(*a*) Rules and regulations prohibiting connections or arrangements by which liquids or chemicals of unsafe, unknown, or questionable quality may be discharged or drawn into the public water supply;

(*b*) Provisions to enforce such rules and regulations effectively on all new installations; and

(*c*) A continuing program to detect health hazards and sanitary defects within the water distribution system.

2.21. *Applications.*—For the purposes of these Standards, responsibility for conditions in the water supply systems shall be considered to be held by

(*a*) The water purveyor from the source of supply to the connection to the customer's service piping, and

(*b*) The owner of the property served and the municipal, county, or other authority having legal jurisdiction from the point of connection to the customer's service piping to the free-flowing outlet of the ultimate consumer.

3. AS TO BACTERIOLOGICAL QUALITY

3.1. *Sampling.*—The bacteriological examination of water considered under this section shall be of samples collected at representative points throughout the distribution system.

[3] In freeing samples of chlorine or chloramines, the procedure given in the Standard Methods for the Examination of Water and Sewage, current edition, shall be followed.

The frequency of sampling and the location of sampling points on the distribution system should be such as to determine properly the bacteriological quality of the water supply. The frequency of sampling and the distribution of sampling points shall be regulated jointly by the reporting agency and the certifying authority after investigation by either agency, or both, of the source, method of treatment, and protection of the water concerned.

The minimum number of samples to be collected from the distribution system and examined by the reporting agency or its designated representatives each month should be in accordance with the number as determined from the graph presented in figure 1 of these Standards [4] which is based upon the relationship of population served and minimum number of samples per month:

Population served	*Minimum number of samples per month*
2,500 and under	1
10,000	7
25,000	25
100,000	100
1,000,000	300
2,000,000	390
5,000,000	500

In determining the number of samples examined monthly, the following samples may be included, provided all results are assembled and available for inspection and the laboratory methods and technical competence of the personnel are approved by the reporting and certifying agencies:

(*a*) Samples examined by the reporting agency.
(*b*) Samples examined by local health department laboratories.
(*c*) Samples examined by the water works authority.
(*d*) Samples examined by commercial laboratories.

Daily samples collected following an unsatisfactory sample as provided in sections 3.22 and 3.24 shall be considered as special samples and shall not be included in the determination of the number of samples examined monthly. Neither shall subsequent unsatisfactory samples in this daily series be used as a basis for prohibiting the supply, provided that (1) immediate and active efforts are made to locate the cause of such contamination, (2) immediate action is taken to eliminate such cause, and (3) samples taken following such remedial action are satisfactory.

The laboratories in which these examinations are made and the methods used in making them shall be subject to inspection at any

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[4] For the purpose of uniformity and simplicity in application, the number of samples to be examined each month for any given population served shall be determined from the graph in accordance with the following:

For populations of 25,000 and under to the nearest 1.
For populations of 25,001 to 100,000 to the nearest 5.
For populations of 100,001 to 2,000,000 to the nearest 10.
For populations of over 2,000,000 to the nearest 25.

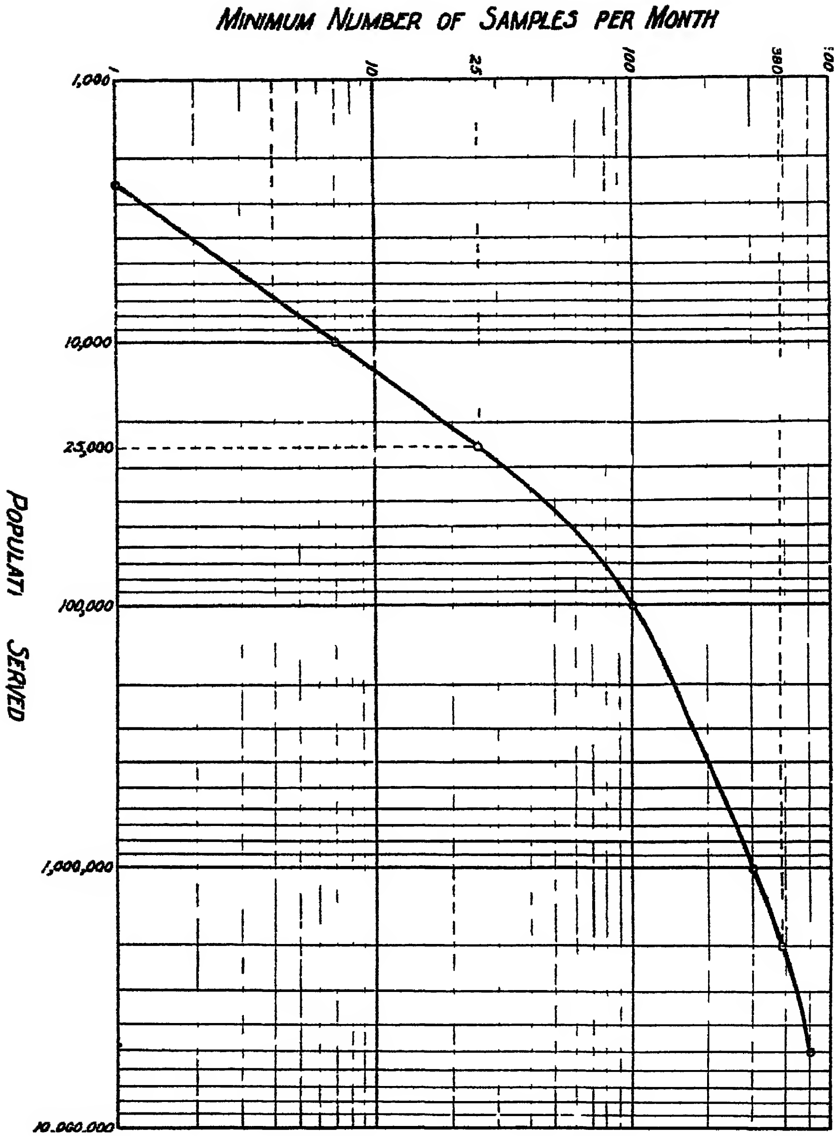

FIGURE 1.—Relation between minimum number of samples to be collected per month and population served.

time by the designated representatives of the certifying authority and reporting agency. Compliance with the specified procedures and the results obtained shall be used as a basis for certification, in accordance with the application given below:

3.2. *Application.*—Applications 3.21 and 3.22 given below shall govern when ten milliliter (10 ml.) portions are used and applications

3.23 and 3.24 shall govern when one hundred milliliter (100 ml.) portions are used.[5]

3.21. Of all the standard ten milliliter (10 ml.) portions examined per month in accordance with the specified procedure, not more than ten (10) percent shall show the presence of organisms of the coliform group.

3.22. Occasionally three (3) or more of the five (5) equal ten milliliter (10 ml.) portions constituting a single standard sample may show the presence of organisms of the coliform group, provided that this shall not be allowable if it occurs in consecutive samples or in more than:

(*a*) Five (5) percent of the standard samples when twenty (20) or more samples have been examined per month.

(*b*) One (1) standard sample when less than twenty (20) samples have been examined per month.

Provided further that when three or more of the five equal ten milliliter (10 ml.) portions constituting a single standard sample show the presence of organisms of the coliform group, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two consecutive samples show the water to be of satisfactory quality.[6]

3.23. Of all the standard one hundred milliliter (100 ml.) portions examined per month in accordance with the specified procedure, not more than sixty (60) percent shall show the presence of organisms of the coliform group.

3.24. Occasionally all of the five (5) equal one hundred milliliter (100 ml.) portions constituting a single standard sample may show the presence of organisms of the coliform group, provided that this shall not be allowable if it occurs in consecutive samples or in more than:

(*a*) Twenty (20) percent of the standard samples when five (5) or more samples have been examined per month.

(*b*) One (1) standard sample when less than five (5) samples have been examined per month.

Provided further that when all five of the standard one hundred milliliter (100 ml.) portions constituting a single standard sample show the presence of organisms of the coliform group, daily samples from the same sampling point shall be collected promptly

[5] It is to be understood that in the examination of any water supply the series of samples for any one month must conform to both of the above requirements, either 3.21 and 3.22 or 3.23 and 3.24, respectively.

[6] When this occurs, and when waters of unknown quality are being examined, simultaneous tests should be made on multiple portions of a geometric series ranging from 10 ml. to 0.1 ml. or less.

and examined until the results obtained from at least two consecutive samples show the water to be of satisfactory quality.[7]

3.25. The procedure given, using a standard sample composed of five standard portions, provides for an estimation of the most probable number of coliform bacteria present in the sample as set forth in the following tabulation:

Number of portions		Most probable number of coliform bacteria per 100 ml.	
Negative	Positive	When 5–10-ml. portions are examined	When 5–100-ml. portions are examined
5	0	Less than 2.2	Less than 0.22
4	1	2.2	.22
3	2	5.1	.51
2	3	9.2	.92
1	4	16.0	1.60
0	5	More than 16.0	More than 1.60

4. AS TO THE PHYSICAL AND CHEMICAL CHARACTERISTICS

4.1. *Physical characteristics.*[8]—The turbidity of the water shall not exceed 10 p. p. m. (silica scale), nor shall the color exceed 20 (standard cobalt scale). The water shall have no objectionable taste or odor.

4.2. *Chemical characteristics.*—The water shall not contain an excessive amount of soluble mineral substance, nor excessive amounts of any chemicals employed in treatment. Under ordinary circumstances, the analytical evidence that the water satisfies the physical and chemical standards given in sections 4.1 and 4.21 and simple evidence that it is acceptable for taste and odor will be sufficient for certification with respect to physical and chemical characteristics.

4.21. The presence of lead (Pb) in excess of 0.1 p. p. m., of fluoride in excess of 1.5 p. p. m., of arsenic in excess of 0.05 p. p. m., of selenium in excess of 0.05 p. p. m., of hexavalent chromium in excess of 0.05 p. p. m., shall constitute grounds for rejection of the supply.

These limits are given in parts per million by weight and a reference to the method of analysis recommended for each determination is given in section 4.31. Salts of barium, hexavalent chromium, heavy metal glucosides, or other substances with deleterious physiological effects shall not be added to the system for water treatment purposes.

Ordinarily analysis for these substances need be made only semiannually. If, however, there is some presumption of unfitness because of these elements, periodic determination for the element in question should be made more frequently.

[7] When this occurs, and when waters of unknown quality are being examined, simultaneous tests should be made on multiple portions of a geometric series ranging from 100 ml. to 1.0 ml. or less.

[8] The requirements in section 4.1 relating to turbidity and color shall be met by all filtered water supplies Turbidity and color limits for unfiltered waters and the requirements of freedom from taste or odor for either filtered or unfiltered waters should be based on reasonable judgment and discretion, giving due consideration to all the local factors involved.

Where experience, examination, and available evidence indicate that such substances are not present or likely to be present in the water supplies involved, semiannual examinations are not necessary, provided such omission is acceptable to the reporting agency and the certifying authority.

4.22. The following chemical substances which may be present in natural or treated waters should preferably not occur in excess of the following concentrations where other more suitable supplies are available in the judgment of the certifying authority. Recommended methods of analysis are given in section 4.3.

Copper (Cu) should not exceed 3.0 p. p. m.

Iron (Fe) and manganese (Mn) together should not exceed 0.3 p. p. m.

Magnesium (Mg) should not exceed 125 p. p. m.

Zinc (Zn) should not exceed 15 p. p. m.

Chloride (Cl) should not exceed 250 p. p. m.

Sulfate (SO_4) should not exceed 250 p. p. m.

Phenolic compounds should not exceed 0.001 p. p. m. in terms of phenol.

Total solids should not exceed 500 p. p. m. for a water of good chemical quality. However, if such water is not available, a total solids content of 1,000 p. p. m. may be permitted.

For chemically treated waters, i. e., lime softened, zeolite or other ion exchange treated waters, or any other chemical treatments, the following three requirements should be met:

(1) The phenolphthalein alkalinity (calculated as $CaCO_3$) should not be greater than 15 p. p. m. plus 0.4 times the total alkalinity. This requirement limits the permissible pH to about 10.6 at 25° C.

(2) The normal carbonate alkalinity should not exceed 120 p. p. m. Since the normal alkalinity is a function of the hydrogen ion concentration and the total alkalinity, this requirement may be met by keeping the total alkalinity within the limits suggested below when the pH of the water is within the range given. These values apply to water at 25° C.

pH range:	*Limit for total alkalinity (p.p.m. as $CaCO_3$)*
8.0 to 9.6	400
9.7	340
9.8	300
9.9	260
10.0	230
10.1	210
10.2	190
10.3	180
10.4	170
10.5 to 10.6	160

(3) If excess alkalinity is produced by chemical treatment, the total alkalinity should not exceed the hardness by more than 35 p.p.m. (calculated as $CaCO_3$).

4.3. Recommended methods of analysis: [9]

4.31. Ions with required limits of concentration.

Arsenic (As): Official and Tentative Methods of Analysis. Association of Official Agricultural Chemists, 1940, p. 390; also "Colorimetric Microdetermination of Arsenic," Morris B. Jacobs and Jack Nagler, Industrial and Engineering Chemistry, Anal. Ed., **14**: 442 (1942).

Fluoride (F): Standard Methods for the Examination of Water and Sewage, current edition, also Methods of Determining Fluorides, Committee Report, A. P. Black, Chairman. Journal American Water Works Association, **33**: 1965–2017 (1941).

Lead (Pb): Standard Methods for the Examination of Water and Sewage, current edition.

Selenium (Se): Official and Tentative Methods of Analysis. Association of Official Agricultural Chemists, 1940, pp. 11 and 417; also Robinson, W. O., Dudley, H. C., Williams, K. T., and Byers, Horace G.; The Determination of Selenium and Arsenic by Distillation. Industrial and Engineering Chemistry, Anal. Ed., **6**: 274 (1934).

Hexavalent chromium: Standard Methods for the Examination of Water and Sewage, current edition.

4.32. Ions and substances with suggested limits of concentration.

Copper (Cu): Standard Methods for the Examination of Water and Sewage, current edition.

Iron (Fe): and Manganese (Mn): Ibid.

Magnesium (Mg): Ibid.

Zinc (Zn): Ibid.

Chloride (Cl): Ibid.

Sulfate (SO_4): Ibid.

Phenolic compounds: Ibid.

With dibromquinonechlorimide as an indicator.

Total solids: Ibid.

Alkalinity: Ibid.

[9] For the chemical determinations referred to in this report, when given, the methods of analysis recommended by the Association of Official Agricultural Chemists are satisfactory and may be substituted for those recommended in the Standard Methods for the Examination of Water and Sewage, current edition, which are specifically cited.

INCIDENCE OF HOSPITALIZATION, JANUARY 1946

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover hospital service plans scattered throughout the country, mostly in large cities:

Item	January 1945	January 1946
1. Number of plans supplying data	75	81
2. Number of persons eligible for hospital care	15,956,400	17,259,949
3. Number of persons admitted for hospital care	137,055	158,991
4. Incidence per 100 persons, annual rate during current month (daily rate×365)	101.1	108.4
5. Incidence per 1,000 persons, annual rate for the 12 months ended Jan. 31, 1946	103.5	107.3
6. Number of plans reporting on hospital days	22	30
7. Days of hospital care per case discharged during month [1]	8.05	8.00

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED FEBRUARY 16, 1946

[From the Weekly Mortality Index, issued by the Bureau of Census, Department of Commerce]

	Week ended Feb. 16, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	10,063	9,913
Average for 3 prior years	10,066	
Total deaths, first 7 weeks of year	74,530	69,041
Deaths under 1 year of age	632	665
Average for 3 prior years	662	
Deaths under 1 year of age, first 7 weeks of year	4,261	4,471
Data from industrial insurance companies:		
Policies in force	67,161,803	67,037,246
Number of death claims	12,368	11,882
Death claims per 1,000 policies in force, annual rate	9.6	9.2
Death claims per 1,000 policies, first 7 weeks of year, annual rate	11.4	10.6

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PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 23, 1946

Summary

Slight declines in the incidence of influenza were recorded during the week in all of the 9 geographic divisions of the country. A total of 7,234 cases was reported, as compared with 8,411 last week, 4,444 for the corresponding week last year, and a 5-year (1941–45) median of 5,984. In the 10 States reporting currently more than 100 cases each, located in the South Atlantic, South Central, Mountain, and Pacific areas, an aggregate of 6,713 cases occurred (approximately 93 percent of the total). These States are as follows (last week's figures in parentheses): *Increases*—Louisiana 594 (541), Texas 3,030 (2,885); *decreases*—Virginia 743 (937), South Carolina 923 (961), Georgia 113 (139), Alabama 542 (569), Arkansas 259 (318), Oklahoma 127 (314), Arizona 154 (203), California 228 (716). The total for the year to date is 155,013, as compared with 35,025 and 301,265, respectively, for the corresponding periods of 1945 and 1944, and a 5-year median of 39,064. For the period since November 18, 1945, a total of 493,579 cases has been reported, as compared with 50,542 and 626,477, respectively, for the corresponding periods of 1944–45 and 1943–44.

Of the total of 174 cases of meningococcus meningitis, New York reported 21, Illinois and California 15 each, Pennsylvania 14, Texas 10, and Michigan and Missouri 7 each. Of the total of 40 cases of poliomyelitis, Florida reported 5 and Georgia and Mississippi 4 each.

The incidence of diphtheria continues above the normal expectancy; 337 cases were reported during the current week as compared with 261 for the same week last year, and the total to date is 3,211 as compared with 2,627 for the same period last year and a 5-year median of 2,480.

A total of 15,725 cases of measles was reported (as compared with 13,932 last week and a 5-year median of 17,754), of which 8,431, or about 54 percent, were reported in the Middle Atlantic and East North Central areas. The total to date is 69,199, as compared with 13,497 for the same period last year and a 5-year median of 97,528.

Deaths recorded during the week in 93 large cities of the United States totaled 9,470, as compared with 10,063 last week, 9,351 and 9,699, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,820. The total for the year to date is 84,000, as compared with 78,392 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended February 23, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended— Feb. 23, 1946	Week ended— Feb. 24, 1945	Median 1941–45	Week ended— Feb. 23, 1946	Week ended— Feb. 24, 1945	Median 1941–45	Week ended— Feb. 23, 1946	Week ended— Feb. 24, 1945	Median 1941–45	Week ended— Feb. 23, 1946	Week ended— Feb. 24, 1945	Median 1941–45
NEW ENGLAND												
Maine	0	0	0	2	------	3	2	15	138	0	1	1
New Hampshire	0	0	0	------	------	------	------	------	15	1	0	0
Vermont	1	0	0	------	------	------	1	14	14	0	0	0
Massachusetts	3	2	2	------	------	------	260	52	411	4	5	5
Rhode Island	0	0	0	1	40	1	4	12	34	0	1	1
Connecticut	0	0	0	9	4	3	68	69	238	2	1	4
MIDDLE ATLANTIC												
New York	19	12	22	[1] 14	5	[1] 10	1,469	78	1,596	21	27	27
New Jersey	1	2	2	13	[1] 1	15	689	48	1,109	5	6	6
Pennsylvania	13	13	13	6	6	5	1,614	108	2,410	14	25	25
E. NORTH CENTRAL												
Ohio	22	11	10	21	7	24	239	46	217	4	13	6
Indiana	12	7	6	29	4	21	448	16	226	4	4	4
Illinois	10	4	18	8	------	31	1,483	90	553	15	28	12
Michigan [2]	26	7	4	5	5	5	2,103	24	285	7	12	12
Wisconsin	2	3	2	63	12	63	386	38	662	1	2	2
W. NORTH CENTRAL												
Minnesota	6	4	5	2	1	2	22	12	42	1	1	1
Iowa	7	0	4	------	------	8	33	14	276	5	3	1
Missouri	6	3	7	6	5	4	360	5	382	7	7	7
North Dakota	0	3	1	6	57	20	------	2	42	2	1	0
South Dakota	0	2	2	------	1	1	133	16	16	1	1	1
Nebraska	1	3	3	4	10	15	70	15	48	0	1	1
Kansas	6	5	3	27	6	8	939	18	320	1	2	2
SOUTH ATLANTIC												
Delaware	0	2	1	------	------	------	6	9	17	0	1	1
Maryland [2]	14	6	3	16	1	18	172	48	77	5	8	8
District of Columbia	1	1	0	------	1	2	41	9	59	0	4	2
Virginia	6	5	10	743	718	803	349	62	436	5	12	12
West Virginia	1	6	6	8	39	42	22	58	189	0	8	4
North Carolina	14	6	10	------	------	50	237	32	343	1	7	7
South Carolina	11	3	3	923	665	950	170	30	237	2	2	4
Georgia	5	6	4	113	41	122	144	39	349	4	2	2
Florida	2	2	2	4	2	13	90	41	145	6	11	9
E. SOUTH CENTRAL												
Kentucky	9	6	6	10	4	104	426	3	142	3	8	8
Tennessee	4	2	3	91	68	68	186	71	226	7	8	8
Alabama	11	9	9	542	212	389	159	8	172	6	2	3
Mississippi [2]	5	4	4	------	------	------	------	------	------	6	5	5
W. SOUTH CENTRAL												
Arkansas	11	3	5	259	217	223	66	32	122	3	4	4
Louisiana	7	6	5	594	3	12	97	19	83	1	2	2
Oklahoma	1	6	6	127	129	155	154	12	57	1	1	1
Texas	37	52	36	3,030	1,951	1,951	518	339	697	10	25	16
MOUNTAIN												
Montana	6	1	1	3	31	25	11	12	125	0	1	1
Idaho	0	1	1	44	------	------	45	1	30	0	0	0
Wyoming	0	0	0	1	------	52	35	4	65	0	0	0
Colorado	6	9	7	61	20	61	132	17	228	2	4	3
New Mexico	3	2	1	2	2	5	14	5	51	0	2	1
Arizona	12	2	3	154	115	156	39	7	175	0	2	2
Utah [2]	0	0	0	45	30	43	289	46	48	0	0	0
Nevada	0	0	0	------	------	------	------	1	1	0	0	0
PACIFIC												
Washington	5	4	3	------	1	3	469	79	141	1	4	4
Oregon	6	2	2	20	9	41	169	53	132	1	1	1
California	25	34	15	228	21	126	1,362	677	677	15	25	25
Total	337	261	261	7,234	4,444	5,984	15,725	2,406	17,754	174	290	290
8 weeks	3,211	2,627	2,480	155,013	35,025	39,064	69,199	13,497	97,528	1,642	1,987	1,987

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended February 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— Feb. 23, 1946	Poliomyelitis: Week ended— Feb. 24, 1945	Poliomyelitis: Median 1941–45	Scarlet fever: Week ended— Feb. 23, 1946	Scarlet fever: Week ended— Feb. 24, 1945	Scarlet fever: Median 1941–45	Smallpox: Week ended— Feb. 23, 1946	Smallpox: Week ended— Feb. 24, 1945	Smallpox: Median 1941–45	Typhoid and paratyphoid fever [3]: Week ended— Feb. 23, 1946	Typhoid and paratyphoid fever [3]: Week ended— Feb. 24, 1945	Typhoid and paratyphoid fever [3]: Median 1941–45
NEW ENGLAND												
Maine	0	1	0	23	57	14	0	0	0	0	0	0
New Hampshire	0	0	0	2	10	13	0	0	0	0	0	0
Vermont	0	0	0	13	14	14	0	0	0	0	0	0
Massachusetts	1	0	0	153	271	318	0	0	0	3	1	1
Rhode Island	0	0	0	0	17	17	0	0	0	0	0	0
Connecticut	1	0	0	39	114	79	0	0	0	1	2	1
MIDDLE ATLANTIC												
New York	3	2	1	451	486	486	0	0	0	0	3	5
New Jersey	0	3	1	108	130	161	1	0	0	2	2	1
Pennsylvania	1	1	1	319	602	535	0	0	0	1	4	3
EAST NORTH CENTRAL												
Ohio	2	0	0	373	456	318	0	0	0	0	4	4
Indiana	0	0	0	113	208	167	0	3	2	3	0	0
Illinois	0	2	1	210	443	360	0	1	1	0	0	1
Michigan [2]	1	0	1	142	316	241	0	1	0	1	0	1
Wisconsin	1	0	0	141	229	229	0	4	1	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	60	101	101	0	0	0	0	0	0
Iowa	0	0	0	59	72	72	1	0	1	0	2	0
Missouri	1	1	0	75	87	133	0	0	0	3	2	1
North Dakota	0	0	0	1	30	30	0	0	0	0	0	0
South Dakota	0	0	0	18	11	29	0	0	1	0	0	0
Nebraska	1	0	0	34	111	82	0	0	0	0	0	0
Kansas	0	0	0	99	165	117	1	0	0	0	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	7	5	7	0	0	0	1	0	0
Maryland [2]	1	0	0	81	296	102	0	0	0	0	1	1
District of Columbia	0	0	0	26	77	35	0	0	0	0	0	0
Virginia	0	1	1	61	162	44	0	0	0	2	4	2
West Virginia	0	0	0	37	41	43	0	0	0	0	1	2
North Carolina	1	0	0	46	108	44	0	0	0	0	1	0
South Carolina	0	0	0	11	7	7	0	0	0	0	1	2
Georgia	4	0	0	10	37	26	1	0	0	3	0	1
Florida	5	0	1	8	15	15	0	0	0	0	0	0
EAST SOUTH CENTRAL												
Kentucky	0	2	0	29	79	79	0	0	0	0	0	0
Tennessee	2	0	0	24	102	92	0	0	0	1	3	3
Alabama	1	2	0	9	15	18	0	0	0	2	0	1
Mississippi [2]	4	1	1	10	45	11	0	1	0	0	1	1
WEST SOUTH CENTRAL												
Arkansas	1	0	0	11	13	6	1	1	2	0	0	1
Louisiana	1	0	1	13	21	8	0	0	0	2	1	1
Oklahoma	1	3	0	21	35	32	0	0	0	2	0	2
Texas	1	1	1	78	121	66	2	0	0	6	5	2
MOUNTAIN												
Montana	0	0	0	1	40	33	0	0	0	1	0	0
Idaho	0	0	0	2	56	10	0	0	0	0	0	0
Wyoming	0	0	0	5	7	11	0	0	0	0	0	0
Colorado	1	0	0	34	101	63	0	0	0	2	2	0
New Mexico	0	0	0	24	26	7	0	0	0	0	3	0
Arizona	0	0	0	8	28	12	0	0	0	0	0	0
Utah [2]	0	0	1	41	51	51	0	0	0	0	0	0
Nevada	0	0	0	0	2	0	0	1	0	0	0	0
PACIFIC												
Washington	2	0	0	19	119	62	0	0	0	0	0	0
Oregon	0	0	0	21	47	18	0	0	0	1	0	1
California	3	6	3	218	378	153	1	0	0	2	3	3
Total	40	26	25	3,288	5,964	4,367	8	12	16	39	47	65
8 weeks	353	314	228	24,382	41,922	30,415	58	77	170	320	478	555

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 3; New Jersey 2; Georgia 1; California 1.

Telegraphic morbidity reports from State health officers for the week ended February 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough, Week ended— Feb. 23, 1946	Whooping cough, Week ended— Feb. 24, 1945	Whooping cough, Median 1941–45	Week ended Feb. 23, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	32	32	32								
New Hampshire	1	1	1								
Vermont	14	30	23								1
Massachusetts	81	168	138								
Rhode Island	22	18	18								
Connecticut	58	48	60								
MIDDLE ATLANTIC											
New York	177	171	276	5	4		2		2		1
New Jersey	108	115	115			1					
Pennsylvania	123	171	204				1				1
EAST NORTH CENTRAL											
Ohio	84	187	187								4
Indiana	10	26	26						2		1
Illinois	97	60	67	1	1						1
Michigan [3]	132	89	137	1	2						
Wisconsin	62	57	146								
WEST NORTH CENTRAL											
Minnesota	12	19	38	2							6
Iowa	4	2	14								
Missouri	4	1	26								
North Dakota			13			1	1				
South Dakota		2	3								5
Nebraska	4	3	14								1
Kansas	17	46	43								1
SOUTH ATLANTIC											
Delaware	5	1	1								
Maryland [3]	24	40	46								1
District of Columbia	5	6	7								
Virginia	43	54	55			42			1		2
West Virginia	5	45	39								1
North Carolina	56	83	126						4	1	
South Carolina	31	67	58	2	4					3	
Georgia	4	11	22	1					2	6	1
Florida	20	15	15							2	3
EAST SOUTH CENTRAL											
Kentucky	23	41	53								
Tennessee	12	23	55			1	1		3		2
Alabama	13	22	33	2						4	1
Mississippi [3]									1	8	
WEST SOUTH CENTRAL											
Arkansas	9	18	18	3	2		1				
Louisiana	4	1	2	1					4	2	1
Oklahoma	1	25	15		1						
Texas	108	279	279	27	172	20			1	26	11
MOUNTAIN											
Montana	4	11	17								
Idaho	7										
Wyoming		7	3								
Colorado	31	27	30	1							
New Mexico	6	9	15		1	7					
Arizona	4	53	37			10					
Utah [3]	12	55	25								
Nevada	3										
PACIFIC											
Washington	33	16	24								1
Oregon	15	18	18								1
California	71	233	247	3	2		1				5
Total	1,582	2,406	2,988	49	189	82	7	0	20	52	52
Same week, 1945	2,406			30	368	59	8	1	13	54	71
Average, 1943–45	2,707			29	298	68	9	[4] 1	10	[4] 36	
8 weeks: 1946	14,396			322	2,428	955	61	3	175	438	503
1945	18,423			222	4,681	1,016	50	4	189	479	675
Average, 1943–45	21,277		[4] 30,944	184	2,652	660	65	[4] 4	138	[4] 377	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

NOTIFIABLE DISEASES, FOURTH QUARTER 1945 [1]

The figures in the following table are the totals of the monthly morbidity reports received from the State health authorities for October, November, and December 1945. These reports are preliminary and the figures are therefore more or less incomplete. In most instances they include cases reported in both civilian and military populations. The comparisons made are with similar preliminary reports; but owing to population shifts and the presence of large military populations in certain States, the figures for some States are not comparable with those for prior years, especially for certain diseases. Each State health officer has been requested to include in the monthly report for his State all diseases that are required by law or regulation to be reported in the State, although some do not do so. The lists of diseases required to be reported are not the same for each State. Only 11 of the common communicable diseases are notifiable in all the States. In some instances cases are reported, in some States, of diseases that are not required by law or regulation to be reported, and the figures are included although manifestly incomplete. There are also variations among the States in the degree of completeness of reporting of cases of the reportable diseases. As compared with the deaths, incomplete case reports are obvious for such diseases as malaria, pellagra, pneumonia, and tuberculosis, while in many States other diseases, such as puerperal septicemia, rheumatic fever, and Vincent's infection, are not reportable.

In spite of these known deficiencies, however, these monthly reports, which are published quarterly and annually in consolidated form, have proved of value in presenting early information regarding the reported incidence of a large group of diseases and in indicating a trend by providing a comparison with similar preliminary figures for prior years. The table also gives a picture of the geographic prevalence of certain diseases, as the States are arranged by geographic location.

Leaders are used in the table to indicate that no case of the disease was reported.

Consolidated monthly State morbidity reports for October, November, and December 1945

Division and State	Anthrax	Chickenpox	Conjunctivitis [2]	*Diphtheria	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, infectious	German measles	Hookworm disease	Influenza	Malaria [3]	*Measles	*Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENGLAND																		
Maine	-----	426	-----	56	-----	-----	-----	2	21	-----	11	13	27	4	936	-----	-----	126
New Hampshire	-----	229	-----	13	-----	1	-----	-----	1	-----	101	-----	139	3	223	-----	-----	10
Vermont	-----	794	-----	9	-----	-----	-----	-----	52	-----	267	-----	13	2	351	-----	-----	18
Massachusetts	1	2,002	70	58	7	60	-----	9	162	3	-----	162	2,006	35	1,518	40	-----	[4] 353
Rhode Island	-----	163		6	1	8	-----	-----	1	-----	82	52	11	6	162	-----	-----	[5] 141
Connecticut	-----	998	-----	16	1	43	-----	-----	59	3	50	168	110	18	1,467	1	-----	691
MIDDLE ATLANTIC																		
New York	1	2,927	-----	115	50	468	-----	10	-----	-----	[6] 254	270	1,866	146	[6] 747	8	-----	4,714
New Jersey	1	2,426	-----	43	25	1	29	2	141	-----	532	281	214	63	1,012	3	-----	1,267
Pennsylvania	-----	2,708	-----	102	2	3	-----	4	-----	-----	183	-----	3,123	88	1,268	4	-----	633
EAST NORTH CENTRAL																		
Ohio	1	1,950	-----	485	4	7	8	1	59	-----	633	51	154	64	392	96	-----	758
Indiana	-----	541	4	170	7	2	17	5	13	-----	4,820	87	78	33	105	-----	2	117
Illinois	-----	1,894	-----	73	49	45	-----	14	98	-----	781	3	2,208	124	712	128	-----	2,177
Michigan	-----	3,192	37	221	16	67	2	-----	148	-----	60	107	2,025	52	1,739	5	-----	615
Wisconsin	-----	4,982	-----	46	1	-----	-----	-----	69	-----	4,724	7	338	31	2,815	-----	-----	[4] 202

WEST NORTH CENTRAL																		
Minnesota		1,290		175	21	3		3		2	36	177	60	29				93
Iowa		442		121					6		660	80	47	25	302		2	38
Missouri		151		102			6	3	6		237	40	254	37	93			305
North Dakota		144		30				1			4,325		22	3				167
South Dakota		186		22			1				26	6	21	5	134			26
Nebraska		287		31							1,479	12	50	3	30			106
Kansas		620	4	74	2				20		31,435	42	382	9	493			283
SOUTH ATLANTIC																		
Delaware		24		7		3					41	2	12	3	14			8
Maryland		474	1	210	4	3	6		39		369	49	74	13	77	8	1	668
District of Columbia		76		5	1	2		1			83	11	18	8	25		1	347
Virginia		269		345	6		874				22,834	99	370	17	85		4	669
West Virginia		214		159	1	2		1			18,353	34	26	23	59			183
North Carolina				895	11	13		1				67	184	23				
South Carolina		196		270	30	218			48	326	16,294	1,741	399	6	184	13	197	1,288
Georgia		135	5	347	9	18	5			953	2,539	166	79	21	59		7	220
Florida		70	4	89	17	7		1	11	1,185	73	5	49	20	131	2		137
EAST SOUTH CENTRAL																		
Kentucky		156		191	3	9			33		119,543	92	1,087	23	70			249
Tennessee		108		398	2		18	4	9		1,720	52	59	38	62	4	10	497
Alabama		161		311	13			2	190		4,397	485	26	39	145		6	769
Mississippi		988		372	274	1,234				1,182	31,759	3,006	744	32	582	7	372	4,285
WEST SOUTH CENTRAL																		
Arkansas		94		285	32	77			18		6,050	257	124	21	184		4	580
Louisiana		69		208	51	16			9	405	7,522	115	41	15	59	14	3	596
Oklahoma		83		108	7	15	1			2	3,601	129	107	7	57		6	252
Texas		1,403		891	150	3,454	479	1			58,507	1,626	524	73	1,045	20	177	2,936
MOUNTAIN																		
Montana		813	14	42					36		1,949	9	137	6	401			70
Idaho	2	365	10	17	2		2	3	72		2,796	10	1,156	5	43			93
Wyoming		87		6	3		1				300		76		37			44
Colorado		981		91	10	6		4	10		2,827	[7] 82	208	10	214			327
New Mexico		72		47	6	36	15	1	4		56	24	31	3	157		3	181
Arizona		119		43	1	2	263	1	19		5,003	69	28	5	310	1	3	325
Utah		765		4	1				38		31,698	8	255	3	192			76
Nevada		51	2			2	3				266	3	225	1	20			28
PACIFIC																		
Washington		1,363	13	73	3		166	3	269		6,085		2,463	26	1,143			115
Oregon		633		64			1				5,577	12	182	5	188			131
California		3,951	12	462	44	73		62	934		811	481	3,527	131	5,000			[4] 712
Total	6	42,072	182	7,911	867	5,898	1,897	145	2,598	4,061	401,755	[7] 10,192	25,449	1,357	25,042	354	798	28,746
Fourth quarter 1944	5	67,810	410	5,723	888	9,874	2,226	135	2,316	3,812	38,579	10,881	9,070	2,257	26,082	365	815	23,357
Median, 1940–44	17	67,810		5,723	641	4,730	1,569	141	2,965	5,188	40,316	11,128	39,231	1,111	26,082	365	1,093	31,301
Hawaii Territory		109		3	7	26			63	28	3	[8] 7	657	1	38			[4] 25
Panama Canal Zone [9]		25		58	7	10						180	2	5	9			[10] 133

See footnotes at end of table.

Consolidated monthly State morbidity reports for October, November, and December 1945—Continued

Division and State	*Poliomyelitis	Rabies in man	Rheumatic fever	Rocky Mountain spotted fever	*Scarlet fever	Septic sore throat	*Smallpox	Tetanus	Trachoma	Trichinosis	*Tuberculosis, all forms	Tuberculosis, respiratory	Tularemia	*Typhoid and paratyphoid fever	Paratyphoid fever	Typhus fever, endemic	*Undulant fever	Vincent's infection	*Whooping cough
NEW ENGLAND																			
Maine	21				341	4				2	100	100		12	2		11	10	3[illegible]
New Hampshire	2				158	13					28						2	2	2[illegible]
Vermont	19				79	2					9			3	1		14	41	3[illegible]
Massachusetts	197				1,361	32		2		3	688	646		25	17		22		1,8[illegible]
Rhode Island	3		11		97	2					113	106		6	3		10	1	2[illegible]
Connecticut	67				231	38		1		2	317	309		15	5	1	39		5[illegible]
MIDDLE ATLANTIC																			
New York	416	1		3	[11] 2,726			4		7	2,834	2,070	1	65	9	8	69		3,4[illegible]
New Jersey	159			1	570	17		1		3	715		1	17	4	4	22		2,0[illegible]
Pennsylvania	179		148	2	1,704			1			784		5	55			32		2,0[illegible]
EAST NORTH CENTRAL																			
Ohio	148		21	1	2,886	36	1	3			1,582	1,550	7	47	11	1	27	8	1,71[illegible]
Indiana	56	1			776	39	9	7			885	800	2	16	1		11	33	31[illegible]
Illinois	309		60	1	1,062	26	3	10	12		1,550	1,382	32	22	3		77	18	1,1[illegible]
Michigan	82		90		1,764	46	1	4			1,292		3	44	21		52		1,8[illegible]
Wisconsin	394				1,006	51					579		1	9			83		9[illegible]
WEST NORTH CENTRAL																			
Minnesota	102		21		473	127		3			377		2	7	1		56	36	184
Iowa	149		2		529	5	1				132		1	5			[13] 266	17	78
Missouri	138	1	20	1	578	4	3				446		12	23			10		97
North Dakota	1		3		108	5	2		10		33	30		5	1		5	15	12
South Dakota	6			1	77				15		58			1		1	11	3	29
Nebraska	40				333		4				116								51
Kansas	43	1	3		832	7	4				115	110	7	8		1	62	32	256
SOUTH ATLANTIC																			
Delaware	7				61			1			40	40		10		1			22
Maryland	21		30		538	27		1			503	583	15	11				8	41[illegible]

District of Columbia	38				162						386	374	1	11		1			81
Virginia	52			8	1,217	704		3			663	663	12	42	4	9	6		438
West Virginia	13				957	5					408			16			2		200
North Carolina	43			2	990	28					612	503	7	11	2	50	4		676
South Carolina	27	1	177		156		1	2			159		4	15	4	71	4		831
Georgia	42		[11] 201		340	50	1	2		2	408	406	6	34	14	400	27	43	218
Florida	58				89	15		14			239	237	2	28	7	73	7	16	44
EAST SOUTH CENTRAL																			
Kentucky	19			4	728	16			19		417	412	55	42	1		4	6	471
Tennessee	116			2	661	45	2	2		1	816		16	44	2	43	9	43	275
Alabama	24			2	312		2	5			569		5	32	9	144	17		224
Mississippi	35				320		15		9		416	413	10	13		64	16		1,106
WEST SOUTH CENTRAL																			
Arkansas	20				225	275	5	1	51		289	276	17	39		11	11		70
Louisiana	58	1	87		263	237		20			415	389	4	31	1	137	19		19
Oklahoma	32			1	288	43	4	4	21		441			19	5		9	3	84
Texas	134	1			1,404	205	2		24		1,309		7	136	12	444	131		1,357
MOUNTAIN																			
Montana	30		9		191	39	4		12		99	37	1	15			3	9	48
Idaho	11		15		140	70	5			1	76			3			7	32	216
Wyoming	10		1		39	5					16		2	3					10
Colorado	35		52		401	69					148			20	1		2	29	287
New Mexico	10			1	203	11					386	371		17			1		78
Arizona	14				149	5			50		292			7			2		86
Utah	54		25	2	237						31	29	4	6	2		8		111
Nevada			1		42	15			2		26			3				10	38
PACIFIC																			
Washington	128		51		423	56					808			13	3		15	37	421
Oregon	31		2		325	67	2	1			126	122		13	4		14		124
California	415		239		2,958			12	9	5	2,618	2,476	4	57	28	41	63		1,543
Total	4,008	7	1,284	32	32,260	2,441	71	104	234	26	25,514	15,124	246	1,076	184	1,505	1,262	482	27,460
Fourth quarter, 1944	4,606	14	483	27	37,725	1,843	67	108	490	67	27,208	15,302	282	1,052	159	1,607	1,191	576	24,204
Median, 1940-44	3,219	8		25	32,746	1,843	149	108	687	67	27,058	14,818	282	1,410		1,146	860	560	40,783
Hawaii Territory					7	12					223	210		3	3	22	3		1
Panama Canal Zone [9]	4				2						[10] 9	[10] 9		2	1	1			[10] 7

See footnotes on next page.

FOOTNOTES FOR PRECEDING TABLE

*Diseases marked with an asterisk (*) are reportable by law or regulation in all the States, including the District of Columbia. Typhoid fever is reportable in all the States; paratyphoid fever in all except 6 States. Syphilis is reportable in all the States and the District of Columbia but is not included in the table. Chickenpox, conjunctivitis, influenza, and pellagra were dropped from the list of reportable diseases in North Carolina in 1945. Rheumatic fever has been made reportable in Louisiana.

[1] For reports for first, second, and third quarters of 1945, see pp. 622, 1150, and 1508 of the PUBLIC HEALTH REPORTS of June 1, Sept. 28, and Dec. 14, 1945, respectively.
[2] Includes cases of kerato- and suppurative conjunctivitis and of pink eye.
[3] In some States practically all in the military.
[4] Lobar pneumonia only.
[5] Includes 103 cases of pneumonia not previously reported.
[6] New York City only.
[7] Exclusive of prisoners of war.
[8] Off-shipping.
[9] Includes the cities of Colon and Panama.
[10] In the Canal Zone only.
[11] Includes septic sore throat.
[12] Includes delayed reports.
[13] Includes 194 cases of rheumatic fever reported from the U. S. Naval Hospital at Dublin, Ga.

The following list includes certain rare conditions, diseases of restricted geographical distribution, and those reportable in or reported by only a few States:

Actinomycosis: Massachusetts 1, Connecticut 1, Illinois 1, Minnesota 4, Kansas 1.
Botulism: California 13.
Coccidioidomycosis: New Mexico 3, California 13.
Dengue: South Carolina 4, Louisiana 21, Idaho 2.
Dermatitis: New Hampshire 4, Missouri 103.
Diarrhea: New Jersey 1, Ohio 170 (includes enteritis), Indiana 1, Illinois 1, South Dakota 4, Maryland 41, South Carolina 1,828, Florida 11, Colorado 4 (includes enteritis), New Mexico 65, Utah 1, Oregon 2 (includes enteritis), California 19.
Dog bite: Illinois 1,091, Michigan 1,303, Arkansas 63.
Filariasis: Minnesota 1.
Food poisoning: Maine 1, Indiana 5, Illinois 2, South Carolina 24, Louisiana 7, California 141.
Granuloma (unspecified): Ohio 28.
Granuloma inguinale: Missouri 2, Florida 63, Tennessee 20, Mississippi 156, Louisiana 67, Montana 1, Arizona 1.
Impetigo contagiosa: Ohio 3, Indiana 26, Illinois 22, Michigan 574, Missouri 4, Kansas 13, Maryland 7, Montana 7, Idaho 18, Colorado 10, Nevada 52, Washington 302, Hawaii Territory 14.
Jaundice (includes hepatitis and Weil's disease): Maine 5, Ohio 1, Indiana 43, Illinois 63, Michigan 32, Minnesota 5, Kansas 6, Maryland 10, South Carolina 13, Florida 2, Louisiana 4, Montana 6, Idaho 6, Utah 22, Oregon 10, California 108, Hawaii Territory 16.
Leprosy: Louisiana 3, Texas 1, California 1, Hawaii Territory 10.
Lymphocytic choriomeningitis: Massachusetts 2, Minnesota 1, Tennessee 7.
Lymphogranuloma venereum: Missouri 7, Florida 30, Tennessee 20, Louisiana 45.
Psittacosis: New York 1, Pennsylvania 1, Illinois 1.
Puerperal septicemia: Tennessee 1, Mississippi 14, Louisiana 20, Oregon 1.
Rabies in animals: New York 137, Ohio 116, Illinois 72, Michigan 3, Iowa 12, Kansas 4, Maryland 11, District of Columbia 1, South Carolina 28, Alabama 123, Arkansas 49, Louisiana 13, Texas 235, New Mexico 3, Utah 2, California 90.
Rat bite fever: Tennessee 1, Oklahoma 1.
Relapsing fever: Kansas 1, Texas 2, Nevada 2, California 2.
Ringworm disease: Pennsylvania 270, Illinois 1,159, Michigan 835, Minnesota 170, Iowa 7, Missouri 4, Kansas 22, Montana 7, Idaho 8, Nevada 4, Washington 192.
Scabies: Pennsylvania 47, Ohio 1, Michigan 101, Missouri 4, South Dakota 2, Kansas 33, Montana 26, Idaho 36, Nevada 33.
Silicosis: Ohio 3, Idaho 1, New Mexico 3.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 16, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	1	0	------	0	------	0	0	0	6	0	0	8
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	1	0	6	0	0	------
Massachusetts:												
Boston	3	0	------	1	58	1	17	1	32	0	0	22
Fall River	0	0	------	0	------	3	2	0	5	0	0	7
Springfield	0	0	------	0	5	0	0	0	16	0	0	3
Worcester	0	0	------	0	6	0	14	0	7	0	0	6
Rhode Island:												
Providence	0	0	------	0	3	0	6	0	5	0	0	34
Connecticut:												
Bridgeport	0	0	1	1	1	0	2	0	3	0	0	1
Hartford	0	0	1	0	1	0	4	0	5	0	0	6
New Haven	0	0	1	0	3	0	0	0	3	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo	5	0	------	0	42	1	4	0	15	0	0	35
New York	10	1	18	1	391	6	92	3	284	0	0	47
Rochester	0	0	------	0	94	1	0	1	14	0	0	9
Syracuse	0	0	------	1	637	0	8	0	11	0	0	8
New Jersey:												
Camden	2	0	------	0	14	1	0	0	3	0	0	------
Newark	0	0	------	0	231	1	8	0	14	0	0	19
Trenton	0	0	2	0	0	0	6	0	4	0	0	2
Pennsylvania:												
Philadelphia	2	0	4	2	694	2	23	0	41	0	0	29
Pittsburgh	2	0	------	1	2	3	9	0	15	0	0	6
Reading	0	0	------	1	63	0	2	0	4	0	0	12
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	7	0	1	2	36	0	9	0	9	0	0	2
Cleveland	0	0	2	1	7	1	9	0	32	0	1	10
Columbus	4	0	1	1	3	0	4	0	6	0	0	5
Indiana:												
Fort Wayne	0	0	------	1	------	0	1	0	0	0	0	------
Indianapolis	2	0	------	0	230	1	5	0	18	0	0	5
South Bend	0	0	------	0	------	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	------	0	4	0	2	0	0	------
Illinois:												
Chicago	1	1	1	1	758	6	39	0	63	0	2	57
Michigan:												
Detroit	8	3	------	1	1,154	4	16	0	46	0	1	43
Flint	0	0	------	0	17	0	2	0	3	0	0	3
Grand Rapids	0	0	------	0	41	0	1	0	10	0	0	------
Wisconsin:												
Kenosha	0	0	------	0	1	0	0	0	4	0	0	------
Milwaukee	0	0	1	1	174	2	4	0	17	0	0	15
Racine	0	0	------	0	2	0	0	0	0	0	0	------
Superior	0	0	------	0	1	0	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	5	0	------	0	3	0	2	0	3	0	0	1
Minneapolis	1	0	------	0	9	2	2	0	4	0	0	1
St. Paul	0	0	------	0	------	1	6	0	9	0	0	6
Missouri:												
Kansas City	5	0	------	1	123	0	15	0	16	0	0	3
St. Joseph	0	0	------	0	26	0	0	0	1	0	0	------
St. Louis	6	0	2	0	30	4	12	0	8	0	1	4

City reports for week ended February 16, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0		0	6	0	5	0	6	0	0	
Kansas:												
Topeka	1	0		0	253	1	0	0	6	0	0	3
Wichita	0	1		0	37	0	4	0	5	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0		1	3	0	5	0	0	0	0	
Maryland:												
Baltimore	13	0	4	3	92	2	13	0	41	0	0	11
Cumberland	0	0		0		0	1	0	3	0	0	
Frederick	0	0		0		0	0	0	0	0	0	
District of Columbia:												
Washington	0	0	5	0	48	3	10	0	22	0	1	4
Virginia:												
Lynchburg	1	0		0		0	1	0	2	0	0	11
Richmond	0	0		1	17	2	5	0	7	0	0	3
Roanoke	0	0		0		0	0	0	2	0	0	
West Virginia:												
Wheeling	2	0		0	1	0	0	0	3	0	0	1
North Carolina:												
Raleigh	0	0		0	9	0	3	0	1	0	0	
Wilmington	1	0		0	1	0	1	0	1	0	0	3
Winston-Salem	0	0		1	1	0	1	0	8	0	0	2
South Carolina:												
Charleston	0	0	23	1	7	0	0	0	3	0	0	1
Georgia:												
Atlanta	2	0	17	1	4	1	3	0	3	0	1	1
Brunswick	0	0		0		0	0	0	0	0	0	
Savannah	0	0	11	0		0	0	0	0	0	0	
Florida:												
Tampa	0	0		0	20	1	2	3	4	0	0	
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	5	3	32	0	11	0	9	0	1	2
Nashville	0	0		1	33	0	9	0	2	0	0	2
Alabama:												
Birmingham	2	0	3	0	1	0	2	0	2	0	0	
Mobile	0	0	45	0		0	4	0	0	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	10	0	10	1	2	0	2	0	0	
Louisiana:												
New Orleans	*11	0	24	3	7	5	*10	1	5	0	2	1
Shreveport	0	0		0		0	4	0	0	0	0	
Texas:												
Dallas	0	0	1	1		0	5	0	7	0	0	1
Galveston	0	0		0	1	0	5	0	0	0	0	1
Houston	1	0		1	1	0	7	0	3	0	0	
San Antonio	0	0	5	0	8	0	5	0	1	0	1	1
MOUNTAIN												
Montana:												
Billings	0	0		0		0	2	1	0	0	0	
Great Falls	2	0		0		0	2	0	1	0	0	
Helena	0	0		0		0	0	0	0	0	0	
Missoula	0	0		0		0	0	0	0	0	0	
Idaho:												
Boise	0	0			1	0	3	0	0	0	0	
Colorado:												
Denver	1	0	16	1	30	1	12	0	14	0	0	14
Pueblo	0	0		0	2	0	2	0	2	0	0	2
Utah:												
Salt Lake City	0	0		3	16	0	2	0	8	0	0	

City reports for week ending February 16, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	3	0	------	0	185	1	5	0	5	0	0	11
Spokane	0	0	------	0	97	0	4	0	7	0	0	4
Tacoma	0	0	------	0	34	0	0	0	7	0	0	------
California:												
Los Angeles	7	0	31	1	80	1	5	1	51	**0	1	6
Sacramento	2	0	------	0	18	1	3	0	1	0	0	------
San Francisco	1	0	9	2	173	2	17	1	14	0	0	2
Total	115	6	244	41	6,088	62	494	12	999	0	12	501
Corresponding week, 1945	58	------	99	35	515	------	496	------	1,773	0	16	590
Average, 1940–45	69	------	679	[1] 51	[2] 4,203	------	[1] 521	------	1,555	2	13	839

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

* Including report from Charity Hospital.
** For the week ended Feb. 1, 1946, the Army reported 1 case of smallpox in Los Angeles, port of embarkation.

Anthrax.—Cases: Philadelphia, 1.
Dysentery, amebic.—Cases: New York, 3; Detroit, 1; Houston, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: New York, 5; Chicago, 1; Detroit, 1; Charleston, S. C., 6; Los Angeles, 3.
Dysentry, unspecified.—Cases: San Antonio, 8.
Leprosy.—Cases: Buffalo, 1.
Tularemia.—Cases: Winston-Salem, 1; Memphis, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: Tampa, 1; Nashville, 1; New Orleans, 4; Dallas, 1; San Antonio, 1; Los Angeles, 1.

***Rates** (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,217,200)*

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	10.5	0.0	7.8	5.2	201	10.5	120.2	2.6	233	0.0	0.0	235
Middle Atlantic	9.7	0.5	11.1	2.8	1,003	6.9	68.0	1.9	187	0.0	0.0	77
East North Central	13.5	2.5	3.7	4.9	1,487	8.6	57.6	0.0	130	0.0	2.5	86
West North Central	36.2	2.0	4.0	2.0	979	16.1	82.5	0.0	105	0.0	2.0	38
South Atlantic	31.8	0.0	100.5	13.4	340	15.1	75.4	5.0	167	0.0	3.3	62
East South Central	17.7	0.0	312.8	23.6	390	0.0	153.5	0.0	77	0.0	5.9	24
West South Central	34.4	0.0	114.8	14.3	77	17.2	109.0	2.9	52	0.0	8.6	11
Mountain	23.8	0.0	127.1	31.8	389	7.9	182.7	7.9	199	0.0	0.0	127
Pacific	20.6	0.0	63.3	4.7	928	7.9	53.8	3.2	134	0.0	1.6	36
Total	17.6	0.9	37.3	6.3	930	9.5	75.5	1.8	153	0.0	1.8	77

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (*rodent*).—A rat found on December 26, 1945, in District 1A, Kukuihaele area, Honokaa, Hamakua District, Island of Hawaii, T. H., was proved positive for plague on December 31, 1945. Two rats found on January 11, 1946, in District 4A, Kapulena area, Honokaa, Hamakua District, Island of Hawaii, T. H., were proved positive for plague on January 16 and January 19, 1946, respectively.

Panama Canal Zone

Notifiable diseases—December 1945.—During the month of December 1945, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	3		4		6		1		14	
Diphtheria	30		2		2		8		42	
Dysentery:										
Amebic	2						6		8	
Bacillary	2	1	1		3		1		7	1
Malaria [1]	12		7		51		67	5	137	5
Measles					1		1		2	
Meningitis, meningococcus	1		3				1		5	
Mumps	2		1		6				9	
Paratyphoid fever	3		1				1		5	
Pneumonia		5		1	43	1		2	[2] 43	9
Poliomyelitis	1								1	
Relapsing fever							2		2	
Scarlet fever							1		1	
Tuberculosis		25		7	5			5	[2] 5	37
Typhus fever (murine)							2		2	
Whooping cough					4			1	[2] 4	1

[1] 19 recurrent cases.
[2] In the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 26, 1946.—During the week ended January 26, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		11	1	160	305	50	49	64	140	780
Diphtheria		2	4	35		7			2	50
Dysentery:										
Amebic						1				1
Bacillary					1				1	2
German measles				6	17			6	8	37
Influenza		1,075			126	2			28	1,231
Measles		20	10	193	951	5	14	13	112	1,318
Meningitis, meningococcus				1	1				1	3
Mumps		1	1	92	227	42	13	74	124	574
Poliomyelitis				1	1		1			3
Scarlet fever		7	20	72	60	12	8	16	28	223
Tuberculosis (all forms)		20	5	113	50		16	14	49	267
Typhoid and paratyphoid fever				11	1				3	15
Undulant fever				1						1
Venereal diseases:										
Gonorrhea		12	17	133	182	38	36	53	94	565
Syphilis		12	2	126	140	13	13	13	25	344
Whooping cough			2	156		6	5	2	1	172

CUBA

Habana—Communicable diseases—4 weeks ended February 2, 1946.—During the 4 weeks ended February 2, 1946, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	1		Malaria	2	
Chickenpox	11		Tuberculosis	13	5
Diphtheria	30	2	Typhoid fever	32	1

Provinces—Notifiable diseases—4 weeks ended January 26, 1946.—During the 4 weeks ended January 26, 1946, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		3	16		12	32
Cerebrospinal meningitis		1					1
Chickenpox		8			1	2	11
Diphtheria	2	25	3		1		31
Hookworm disease		24		3			27
Leprosy	1	2				3	6
Malaria	2	12		2	3	56	75
Measles						3	3
Rabies		1			1		2
Tuberculosis	8	38	9	56	26	58	195
Typhoid fever	13	56	3	30	13	60	175
Typhus fever (murine)					1		1

[1] Includes the city of Habana.

FINLAND

Notifiable diseases—December 1945.—During the month of December 1945, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	9	Ophthalmia neonatorum	9
Chickenpox	1,300	Paratyphoid fever	267
Conjunctivitis	19	Pneumonia (all forms)	2,394
Diphtheria	1,568	Poliomyelitis	16
Dysentery, unspecified	12	Puerperal fever	58
Gastroenteritis	2,509	Rheumatic fever	353
Gonorrhea	1,483	Scabies	4,840
Hepatitis, epidemic	1,037	Scarlet fever	296
Influenza	850	Syphilis	570
Laryngitis	43	Typhoid fever	77
Lymphogranuloma inguinale	1	Vincent's angina	43
Malaria	3	Weil's disease	1
Measles	57	Whooping cough	1,007
Mumps	485		

JAMAICA

Notifiable diseases—4 weeks ended February 9, 1946.—During the 4 weeks ended February 9, 1946, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	3	2	Puerperal fever		3
Chickenpox		8	Scarlet fever	4	5
Diphtheria	2	6	Tuberculosis, respiratory	44	61
Dysentery, unspecified		5	Typhoid fever	24	121
Erysipelas	2	1	Typhus fever (murine)	5	2
Leprosy		1			

NORWAY

Notifiable diseases—November 1945.—During the month of November 1945, cases of certain notifiable diseases were reported in Norway, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	6	Measles	8,510
Diphtheria	567	Mumps	162
Dysentery, unspecified	13	Pneumonia (all forms)	2,306
Encephalitis, epidemic	2	Poliomyelitis	99
Erysipelas	495	Rheumatic fever	203
Gastroenteritis	3,628	Scarlet fever	483
Gonorrhea	645	Scabies	7,348
Hepatitis, epidemic	1,294	Syphilis	124
Impetigo contagiosa	5,002	Tuberculosis (all forms)	641
Influenza	2,377	Typhoid fever	5
Laryngitis, acute	12,622	Typhus fever	8
Lymphogranuloma inguinale	2	Weil's disease	8
Malaria	1	Whooping cough	3,339

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Smallpox

Gold Coast.—For the week ended February 2, 1946, 112 cases of smallpox with 21 deaths were reported in Gold Coast.

Morocco (French).—For the period February 1–10, 1946, 175 cases of smallpox were reported in French Morocco. Regions reporting the highest incidence are: Agadir and frontier districts, 6; Casablanca, 58; Fez, 28; Marrakech, 19; Meknes, 11; Oujda, 1; Rabat, 52.

Sudan (French).—For the period January 21–31, 1946, 152 cases of smallpox were reported in French Sudan.

Typhus Fever

Belgian Congo.—Typhus fever was reported in Belgian Congo as follows: Weeks ended—January 26, 1946, 240 cases, 23 deaths; February 2, 1946, 155 cases, 16 deaths.

Ecuador.—For the month of January 1946, 106 cases of typhus fever with 2 deaths were reported in Ecuador, including 41 cases reported in Riobamba Province and 11 cases reported in Cotopaxi Province.

Egypt.—For the week ended January 19, 1946, 78 cases of typhus fever were reported in all of Egypt.

Morocco (French).—For the period February 1–10, 1946, 153 cases of typhus fever were reported in French Morocco. Regions reporting the highest incidence are: Agadir and frontier districts, 28; Casablanca, 34; Marrakech, 59; Meknes, 12; Fez, 6; Oujda, 4; Rabat, 10.

Turkey.—For the week ended February 16, 1946, 69 cases of typhus fever were reported in Turkey. Ports reporting the highest incidence are: Balikesir, 1; Icel, 3; Istanbul, 4; Izmir, 4; Kocaeli, 1; Samsun, 1.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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Public Health Reports

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PREVALENCE OF DISEASE

Public Health Reports

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THE EXCRETION OF DDT (2,2-BIS-(P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE) IN MAN, TOGETHER WITH CLINICAL OBSERVATIONS[1]

By P. A. Neal, *Medical Director*, T. R. Sweeney, *Associate Chemist*, S. S. Spicer, *Senior Assistant Surgeon*, and W. F. von Oettingen, *Principal Industrial Toxicologist, United States Public Health Service*

It was shown by White and Sweeney (*1*) that following oral administration of DDT in olive oil to rabbits DDT was partly excreted with the urine as di-(p-chlorophenyl)-acetic acid (DDA). So far there is no evidence that the same holds true for humans. Because of the clinical and forensic importance of this question for the detection of DDT poisoning, the excretion of DDT was studied in one human subject and at the same time a clinical study was made to detect any possible toxic symptoms.

CLINICAL OBSERVATIONS

A normal male human subject volunteered for this experiment. The same person had been exposed in July 1943 to a calculated concentration of 1 mg. of DDT per 1,000 cu. ft. for 1 hour daily on 6 consecutive days, and, 4 weeks later, to an even higher concentration for 1 hour daily on 5 consecutive days without any untoward effects (Neal et al. (*2*)). In addition the same subject had ingested 500 mg. of DDT in olive oil in December 1944 without experiencing any signs of toxic effects. In September 1945, after a foreperiod of 2 weeks, during which time the urine was examined daily and the blood was examined twice, the same individual underwent a detailed clinical examination including a teleoroentgenogram, an electrocardiogram, an electroencephalogram, one liver function test, and one blood sugar determination. Special emphasis was placed on nervous functions as indicated by reflex excitability and coordination tests. Following this examination the subject took 11 mg. per kg. of body weight

[1] From the Industrial Hygiene Research Laboratory, National Institute of Health.

(a total of 770 mg.) of pure recrystallized DDT in approximately 25 cc. of olive oil into an empty stomach, and the examination was repeated 48 hours later.

The subject noted no subjective signs or symptoms following the ingestion of this dose, and no deviations from the pre-examination findings were found on the second examination. Specifically, the neurological examination covering coordination tests (finger-nose, finger-finger, and heel-knee) and sensory test showed normal reactions. There was no evidence of muscular fibrillation, tremors, or twitchings; the position sense, figure-writing test, and two-point and sharp-dull discrimination tests showed no abnormalities. The reflexes (biceps, triceps, ankle, knee, corneal, cremasteric, abdominal, Babinski, and Kernig) were unchanged, nor did the electroencephalogram taken 2 hours after the ingestion of DDT show any deviations from that made prior to the ingestion of DDT.

As illustrated in table 1, the daily examination of the urine 2 weeks prior to, and 2 weeks after, the ingestion of DDT showed nothing

TABLE 1.—*The urinary findings of a human subject before and after ingestion of 11 mg. per kg. of body weight (770 mg.) of DDT*

Time	Volume in cc.	Color	Specific gravity	Sugar	Albumen	White blood cells	Red blood cells	Reaction
		FOREPERIOD						
1	2,950	Light yellow, clear	1.010	0	±	3-4	1-2	Neutral.
2	1,955	Light yellow, turbid	1.012	0	0	±	Occasional	Do.
3	1,780	do	1.011	0	0	±	Occasional	Alkaline.
6	2,050	Light yellow, clear	1.015*	0	0	+	Occasional	Neutral.
7	1,865	do	1.010	0	0	±	+	Weakly acid.
8	2,440	do	1.009	0	0	±	±	Neutral.
9	1,880	do	1.010	0	0	±	Occasional	Weakly acid.
10	1,955	Light yellow, slightly turbid	1.011	0	0	±	Occasional	Slightly acid.
14	1,310	Light yellow, clear	1.011	0	0	±	Occasional	Weakly acid.
		EXPOSURE PERIOD						
1	1,900	Light yellow, clear	1.009	0	0	±	±	Weakly acid.
2	1,780	do	1.011	0	0	±	±	Do.
3	1,740	Light amber, clear	1.013	0	0	±	±	Do.
4	2,465	Light yellow, clear	1.010	0	0	±	±	Neutral.
5	2,925	do	1.008	0	0	±	±	Do.
6	2,240	do	1.010	0	±	±	±	Do.
7	[1] 1,620	do	1.013	0	0	±	±	Do.
8	2,730	do	1.010	0	0	±	±	Do.
9	2,640	do	1.010	0	0	±	±	Do.
10	2,800	do	1.010	0	0	±	±	Weakly acid.
11	1,400	do	1.016	0	0	±	Occasional	Acid.
12	1,885	do	1.011	0	0	±	±	Do.
13	1,860	do	1.012	0	0	±	±	Do.
14	2,050	do	1.011	0	0	±	±	Neutral.

[1] Some loss.

abnormal, nor were there any changes of the blood picture 1 and 2 weeks after the exposure (table 2). Determination of the blood sugar 1, 2, 3, 4½, and 5½ hours after the ingestion of DDT, during which time the subject had taken no food, gave normal values of 83.2, 85.0, 82.6, 81.5, and 68.5 mg. percent, the pre-exposure level being 77.4 mg.

TABLE 2.—*The blood picture of a human subject before and after ingestion of 11 mg. per kg. of body weight (770 mg.) of DDT*

Time	Red blood cells (millions)	Hemoglobin (percent)	White blood cells (thousands)	Lymphocytes (percent)	Monocytes (percent)	Stab cells (percent)	Neutrophiles (percent)	Eosinophiles (percent)	Basophiles (percent)
Beginning of foreperiod	4.6	95	9.4	45	1	6	47	1	
1 week before exposure	4.89	92	11.4	26	4	7	54	8	1
Day of exposure	4.7	92	7.7	35	4	8	50	3	
1 week after exposure	4.6	92	9.2	23	9	8	58	2	
2 weeks after exposure	4.9	98	13.2	24	5	9	61	1	

percent. A cephalin-cholesterol flocculation test made 6 days after the ingestion of DDT failed to give evidence of hepatic injury.

These examinations show that following the ingestion of 11 mg. per kg. of body weight, corresponding to 770 mg. of DDT by a normal person, no subjective or objective manifestations could be discovered which would indicate an injurious effect of this dose on the organ functions or the nervous system.

EXCRETORY STUDIES

The excretory studies made with 24-hour urine specimens covered the determination of organic chlorine and of di-(p-chlorophenyl)-acetic acid (DDA), but, as will be shown below, unchanged DDT could not be detected in the urine.

The determination of organic chlorine was made in 24-hour samples of urine preserved with formalin. The urine was acidified with 6 N sulfuric acid to a pH of 2 and then extracted with an equal volume of ether. The extract was washed with distilled water, dried over anhydrous sodium sulfate, and reduced in volume to 50–75 ml. by distillation in a water bath, the temperature of the latter being controlled so that a fair amount of distillation was maintained without excessive heat. The residual extract was then transferred quantitatively to a 100-ml. volumetric flask and made up to volume with ether. As a rule 5-ml. samples of this extract were used for the determination and it was found that larger quantities than this were inconvenient since they caused excessive fouling of the tube and chimney. The chlorine was determined according to the method of Winter (*3*) as modified by Hall, Schechter, and Fleck (*4*). It should be pointed out that the small size of the samples and the small amount of the chlorine present made the relative error comparatively large. In addition, the values found had to be multiplied by a factor of about 22 and thus the absolute values of the final results may be impaired considerably, although they give a fair picture of the amounts excreted. In addition, it was found that contamination of the laboratory air with volatile chlorinated hydrocarbons may give rise to very considerable errors.

The determination of organic chlorine in nine 24-hour urine samples collected during the foreperiod gave an average value of 1.0 mg. with 0.8 and 1.5 mg. as extremes. After the ingestion of 770 mg. of DDT it rose on the first, second, third, and fourth days to 2.9, 4.0, 3.0, and 1.5 mg., respectively, and during the subsequent 10 days the average was 1.0 mg. with 0.8 and 1.4 mg. as extremes. It appears, therefore, that after the ingestion of 770 mg. of DDT the peak of the excretion of organic chlorine occurs during the second 24-hour period and that thereafter the excretion decreases rapidly to normal values.

The determination of di-(p-chlorophenyl)-acetic acid (DDA) was made according to the method of Schechter and Haller (*5*), (*6*), using the procedure as practiced by Ofner and Calvery (*7*), the procedure being briefly as follows:

Five milliliters of the 24-hour urine ethereal extract as used for the determination of organic chlorine were placed in a nitration tube, evaporated to dryness, and dried overnight in a vacuum desiccator over sulfuric acid. The residue was then cooled in an ice bath and 2 ml. of a nitrating mixture consisting of equal parts of fuming nitric and sulfuric acid were added. The reaction mixture was cooled in ice for 5 to 10 minutes and then allowed to come to room temperature. It was then placed in a boiling water bath for exactly 1 hour, cooled again in ice, diluted with ice water, and transferred quantitatively to a 75-ml. separating funnel, diluted to about 35 ml., and extracted with 25 ml. of ether. The ether extract was washed once with 5-percent sodium hydroxide and twice with a saturated solution of sodium chloride, filtered through cotton into a 50-ml., glass-stoppered cylinder, and the ether evaporated completely. The residue was taken up in exactly 3 ml. of benzene, mixed with 6 ml. of sodium methylate solution (5 percent metallic sodium in methanol) and the red color which developed was read after 15 minutes in a Coleman spectrophotometer (model 11A) using a 19-mm. cell and a benzene-sodium methylate solution as blank.

The results of these determinations are given in figure 1. It shows that following the ingestion of 770 mg. of DDT there is a sharp rise in the excretion of di-(p-chlorophenyl)-acetic acid (DDA) which reaches its maximum on the second day, decreases rapidly on the third and fourth days, and thereafter decreases gradually.

It will be noted that prior to the ingestion of DDT the normal urine gave a faint color reaction when treated as for the determination of DDA. Since this cannot be due to small quantities of this compound, it must represent some unknown compound present in normal urine. Figure 2 gives the absorption spectra of five normal urines from 400 to 700 mμ. and it will be seen that these represent essentially a smooth curve. If, however, small quantities of DDA (40 γ) are added to such urine the characteristic absorption curve of DDA becomes apparent, as illustrated in figure 3 which gives the absorption spectra of normal

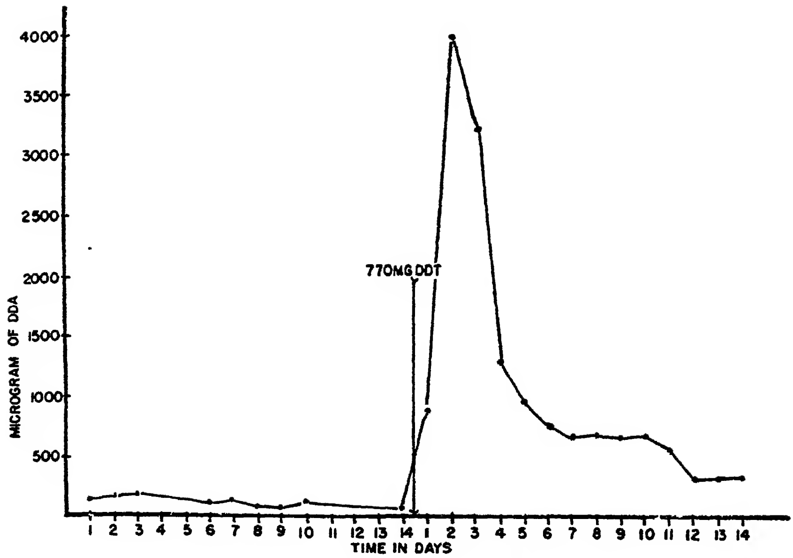

FIGURE 1.—The excretion of DDA in human urine following the ingestion of 770 mg. of DDT in olive oil.

urine, pure DDA in acetone, normal urine containing 40 γ of DDA, and a urine specimen collected on the second day after the ingestion of 770 mg. of DDT. The acidic character of this material was proved by the fact that 75 percent of the material determined could be extracted with alkali. The remaining 25 percent which gave the same color reaction as DDA must represent some other material, as was also pointed out by Ofner and Calvery (7) in excretion studies of DDT with rabbits. This comparison shows beyond reasonable doubt that the results obtained in these determinations represent essentially the values for DDA.

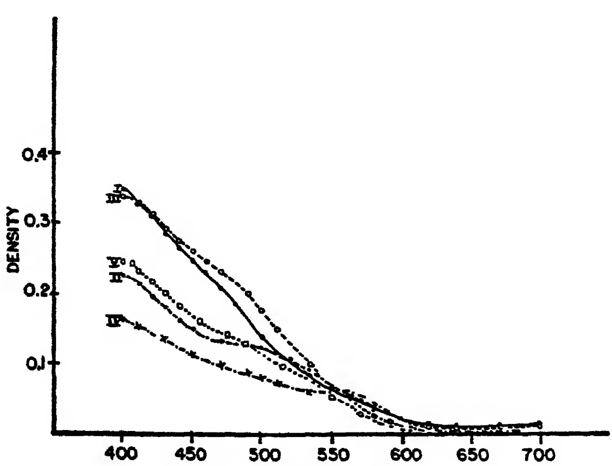

FIGURE 2.—Absorption spectra of the nitration products of extracts of normal urine.

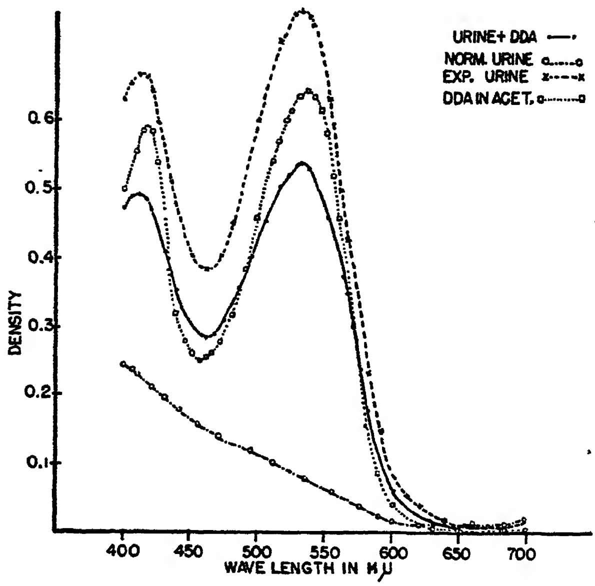

FIGURE 3.—Absorption spectra of normal urine plus 40 γ DDA, normal urine, pure DDA in acetone, and a urine specimen collected on the second day after the ingestion of 770 mg. of DDT in olive oil.

The absence of DDT from the urine is demonstrated by the absorption spectra of the ether extract from urine samples after treatment according to the methods of Schechter and Haller (*5*), (*6*), and Ofner and Calvery (*7*). As illustrated in figure 4, the nitration product of

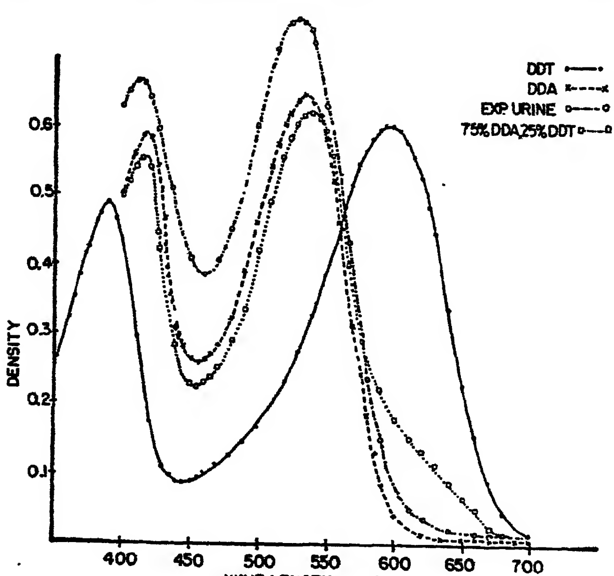

FIGURE 4.—Comparison of the absorption spectra of the nitration products of DDT, a mixture of 75 percent DDA and 25 percent DDT, and a urine specimen collected after the ingestion of 770 mg. of DDT in olive oil.

DDT has a definite absorption in the range between 640 and 700 mμ which still is distinct with a mixture of 75 percent DDA and 25 percent DDT. In contrast to these, the nitration product of DDA has practically no absorption in this range and the same holds true for urine samples collected after the ingestion of DDT. It is therefore apparent that after the ingestion of 770 mg. of DDT no undecomposed DDT was present in the urine in measurable amounts.

SUMMARY AND CONCLUSIONS

This experiment shows that the ingestion of 11 mg. per kg. of body weight of DDT dissolved in olive oil, corresponding to a total dose of 770 mg., did not cause detectable toxic effects in one normal individual. This experiment shows further that, as in rabbits, part of the DDT ingested is metabolized to di-(p-chlorophenyl)-acetic acid (DDA) and excreted with the urine. Under the conditions of this experiment the maximal excretion of this metabolite occurred on the second day; it decreased rapidly on the third and fourth days, and diminished gradually during the subsequent 10 days.

ACKNOWLEDGMENT

The valuable assistance of Assistant Chemist D. C. Peterson in measuring the absorption spectra and of Junior Chemist M. R. Harris in running the analytical determinations is gratefully acknowledged.

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ALTERATIONS IN THE CARDIAC CONDUCTION MECHANISM IN EXPERIMENTAL THIAMINE DEFICIENCY[1]

By W. D. King, *Passed Assistant Surgeon,* and W. H. Sebrell, *Medical Director, United States Public Health Service*

A review of the literature on the nature and character of the cardiac rhythm and electrocardiographic findings in thiamine deficiency revealed no general agreement. In man various changes have been reported: Shortening of the PQ conduction time (*1*), inversion of the T waves (*3, 8*), increased QRS interval to bundle-branch block (*6*), sinus arrhythmia, sinus arrest (*7*), premature beats, auricular tachycardia (*15*), and tachycardia (*13, 17*). The following alterations have been observed in experimental animals: Bradycardia (*2, 5, 9, 10, 14, 18, 19*), shortened or lengthened PR interval (*10*), T wave and ST-segment changes (*14*) in rats; heart block (*4*), tachycardia and inverted T waves (*11*) in pigeons; deviations of the T wave, lengthening of the QT interval (*10*) and tachycardia (*12*) in dogs.

A recent study by Wintrobe et al. (*33*) of thiamine deficiency in swine revealed pronounced electrocardiographic alterations. They found bradycardia, prolonged PR interval, second-degree A-V block, abnormal P waves, inverted T_4, nodal and ventricular premature beats, A-V dissociation, complete heart block with ectopic ventricular rhythm and auricular fibrillation in their animals. These changes were associated with widespread necrosis in the myocardium.

Ashburn and Lowry (*20*) have demonstrated histological changes in the musculature of the auricles, ventricles, and pulmonary vessels in chronic vitamin B_1 deficient rats. The magnitude of these pathological changes in the auricles suggested that there should occur demonstrable electrocardiographic alterations in those cases where such pathology existed. The following study was carried out to evaluate this hypothesis.

METHOD

The animals studied were the 24 pairs of albino rats used by Ashburn and Lowry in the second phase of their study (*20*). One rat of each pair was kept on a diet deficient in thiamine; the other was a littermate control, pair fed with the first but given adequate thiamine. All of the rats were fed a purified diet and given a daily supplement containing 20 micrograms of pyridoxine, 50 micrograms of riboflavin, 50 micrograms of calcium pantothenate, 1 mg. of nicotinic acid, 20 mg. of choline, and a variable amount of thiamine. For the first 6 weeks, each rat in the experimental (thiamine-deficient) group received 4 micrograms of thiamine daily. For the remainder of the experiment thiamine was omitted except during the acute deficiency periods (manifest by spasticity, ataxia, and convulsions) at which time 50

[1] From the Division of Physiology, National Institute of Health.

micrograms of thiamine were injected subcutaneously.[2] Control animals received 100 micrograms of thiamine daily throughout the experimental period.

Electrocardiograms were taken at weekly intervals and, when possible, during acute deficiency periods and following thiamine therapy. Tracings were made by the following technique:

The rats were restrained in a knitted cloth (washcloth) sewn to form a cylinder 4.0 cm. in diameter and 25.0 cm. in length. The forelegs and the left hindleg were withdrawn through the meshes and the electrodes applied. The rats remained in a prone position. The electrodes were made from small battery clips having reduced spring tension. The contact surfaces were covered with chamois. Before applying these to the rat, the electrodes were soaked in 3-percent saline solution and the hair of the legs was smoothed down with electrode paste. Electrocardiograms were taken with a Sanborn string galvanometer to which a Sanborn cardioscope amplifier had been adapted. The camera speed was 75 mm./sec. and the standardization was 1.0 mv.=2.0 cm. of string deflection. (Under these conditions of camera speed and amplification it was found that the tracings were best suited for detailed study and measurement.) Figure 1 presents semi-diagram-

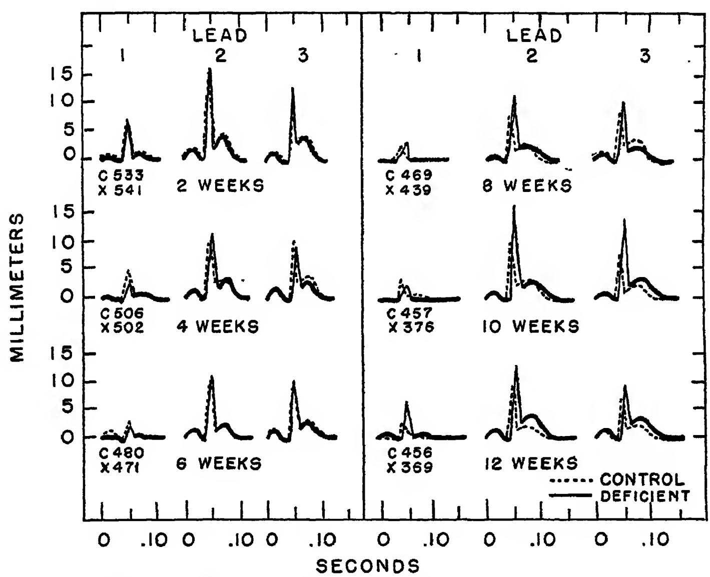


FIGURE 1.—Changes in average heart rates and electrocardiographic configurations of control and thiamine-deficient rats.

matic drawings of the electrocardiograms. These drawings represent the arithmetical mean of the sums of the measurements of the electrocardiograms taken during given periods of the experiment. The measurements used were: PR, QRS, and QT intervals in 0.001 second; the amplitude of the P, Q, R, S, and T deflections in millimeters of deflection from the isoelectric level. The isoelectric level is taken as the level at the beginning of the P wave. The amplitude of the P, Q, R, S, and T waves represents the number of millimeters deflection above or below the isoelectric level.

[2] For further details of the experimental procedure, *see* Ashburn and Lowry (20).

RESULTS

It was noted (fig. 1) that, for the first 6-week period, the heart rates and the general configuration of the electrocardiograms in the control and the experimental groups were almost identical. The average heart rates for the experimental and control animals at the end of this period were 471 and 480 beats per minute, respectively. During the following 6 weeks, after thiamine was completely withdrawn from the diet of the experimental animals, marked differences developed. The average heart rate of the experimental animals progressively decreased to 369 beats per minute as compared to 456 beats per minute for the control rats. In the experimental group there was a progressive widening of the PR and QRS intervals as well as an increase in the amplitude of the $QRS_{2,3}$ and $T_{2,3}$.

In 4 of 11 experimental animals which had electrocardiograms taken during the first acute deficiency episode, auricular fibrillation was noted (fig. 2). In three of these animals the rhythm returned to a normal sinus mechanism within 24 hours after the administration of 50 micrograms of thiamine subcutaneously. The fourth animal died in less than 24 hours after thiamine therapy. Two of these animals died subsequently without further electrocardiographic evidence of altered conduction mechanism.

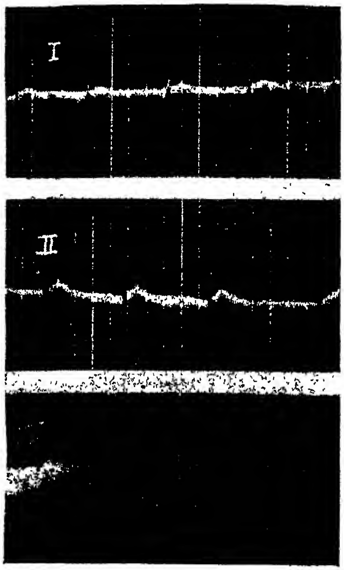
Four of eleven animals which had electrocardiograms taken during their second or third acute deficiency episode exhibited auriculo-ventricular nodal rhythm (fig. 3). One of these animals (No. 16750) had previously exhibited auricular fibrillation.

Premature beats, ectopic beats, bigeminus, auricular standstill, and a shifting pacemaker were not infrequently noted among the deficient group. There were no definite trends in the shifting of the axis; levocardiograms and dextrocardiograms were infrequent and approximately equal in their occurrence.

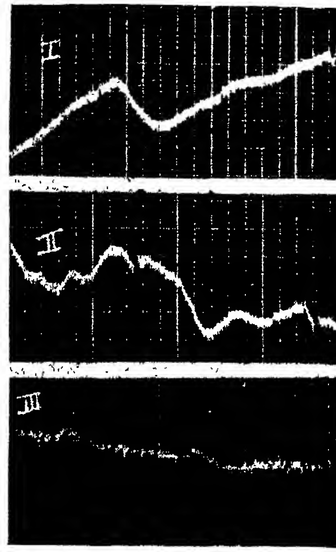
In 14 of the 24 experimental rats pathologic lesions were noted. In 10 of these 14 the lesions were predominantly auricular. Seven of the 14 rats had abnormal electrocardiographic findings.

DISCUSSION

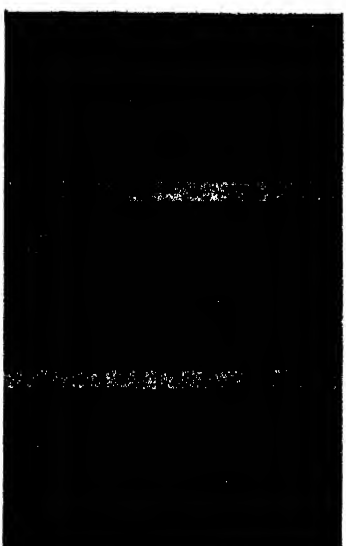
The experimental production of alterations in the cardiac conduction mechanisms and cardiac arrhythmias other than a bradycardia, in rats, as a result of thiamine deficiency has not been reported. Some of de Soldati's (*10*) rats showed variations in the PR interval. An examination of his protocols shows that of his 18 rats, 8 had prolonged PR intervals and in 7 the PR interval was shorter than normal during their acute deficiencies. In pigs, Wintrobe and associates (*33*) have reported electrocardiographic changes which were very similar to the changes in rats reported in this paper. Pigeons also developed heart block and other changes (*4, 11*) similar to the findings in rats.



Rat No. 16735. May 25, 1943. 68 days.



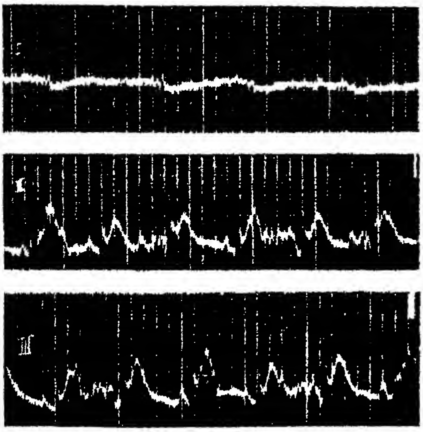
Rat No. 16750. May 24, 1943. 51 days.



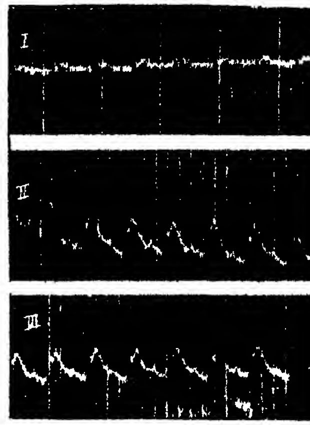
Rat No. 16767. June 12, 1943. 53 days.

Rat No. 16774. July 3, 1943. 67 days.

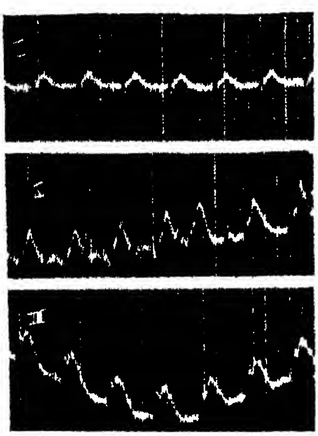
FIGURE 2.—Auricular fibrillation. I, II, and III refer to the respective leads. Standardization 1 mv.= 2 cm. The spaces between the light vertical lines equal 0.04 second; spaces between horizontal lines equal 1 mm.



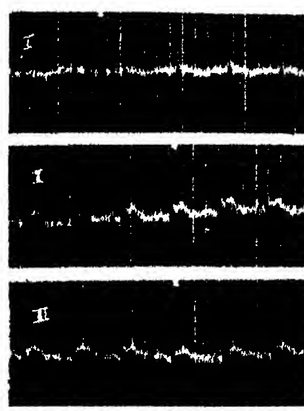
Rat No 16[illegible] June [illegible] 194[illegible] [illegible] days



Rat No 16[illegible] July [illegible] 194[illegible] [illegible] days



Rat No 16750, June 19 1943, [illegible] days



Rat No 16775 July 17, 1943 81 days

FIGURE 3.—Auriculoventricular nodal rhythm. I, II and III refer to the respective leads. Standardization 1 mv = 2 cm. Spaces between the light vertical lines = 0.04 second; spaces between horizontal lines = 1 mm.

In the clinical series of Weiss and Wilkins (*13*) there were three cases in which auricular fibrillation was noted, but this arrhythmia was not considered a part of the cardiac picture in vitamin B_1 deficiency. Since auricular fibrillation can occur in experimental animals apparently as the result of a chronic thiamine deficiency, a possible etiological factor in the occurrence of this arrhythmia, so frequently noted in thyrotoxic heart disease, rheumatic heart disease, and that of "unknown origin," is suggested. Means (*21, 22*), Frazier and Ravdin (*23*), and Gounelle (*24*) have noted a clinical correlation between thiamine deficiency and thyrotoxicosis. Morehead (*25, 26*) has commented on the similiarity of the cardiac manifestations of vitamin B_1 deficiency to those seen in acute rheumatic fever in the young adult.

Auriculoventricular nodal rhythm, when established, was not converted to a normal rhythm by large doses of thiamine (100 micrograms per day) in the two rats so treated. In one rat with an auriculoventricular nodal rhythm, sectioning the vagi did not alter the rhythm. This rhythm tended to maintain a relative bradycardia, 300 ± 30 beats per minute, which was only transiently affected by exercise or excitement.

A direct correlation between the occurrence of auricular fibrillation and nodal rhythm, and the degree of demonstrable pathology could not be established from the data at hand.

The physiological and pathological changes appear to be the result of abnormal tissue metabolism (*27, 28, 29, 30, 31, 32*). It might be expected, therefore, that they would vary in degree and in persistence. Early or slight abnormalities might cause changes which are completely reversible, while more severe deviations from the normal might result in permanent damage to the tissue.

SUMMARY AND CONCLUSIONS

Electrocardiographic studies of rats in thiamin deficiency are reported.

Auricular fibrillation and auriculoventricular nodal rhythm were observed in addition to the previously noted bradycardia. Less frequent conduction defects included premature beats, ectopic beats, auricular standstill, and a shifting pacemaker.

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

January 27–February 23, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended February 23, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended February 23 there were 1,487 cases of diphtheria reported, as compared with 1,242 for the corresponding period in 1945 and a 5-year (1941–45) median of 1,158 cases. In each section of the country except the West South Central and Pacific regions the incidence was higher than in 1945, while all sections except the West South Central reported excesses over the 5-year expectancy. For the country as a whole the current incidence was the highest for this period since 1940, when 1,525 cases were reported.

Influenza.—The number of cases of influenza dropped from approximately 116,000 during the preceding 4 weeks to 38,746 during the 4 weeks ended February 23. The number of cases was, however, 2.2 times the incidence for the corresponding weeks in 1945 and 1.8 times the 1941–45 median (22,139 cases). While each region except the Middle Atlantic and Mountain sections reported an excess over the normal expectancy, the greatest excesses occurred in the Pacific, East North Central, and West South Central sections. The number of cases for the country as a whole was only slightly lower than the number reported for the corresponding weeks in 1944, following the 1943–44 epidemic.

Poliomyelitis.—For the 4 weeks ended February 23 there were 143 cases of poliomyelitis reported as compared with 171, 90, and 92 for the corresponding period in 1945, 1944, and 1943, respectively. While the current incidence was lower than in 1945, it was above the 1941–45 median, which was represented by the 1942 incidence of 171 cases. The greatest increases over the normal seasonal expectancy were reported from the South Atlantic and Pacific sections.

DISEASES BELOW MEDIAN PREVALENCE

Measles.—The number of cases of measles (48,914) was 6 times the number reported for the corresponding period in 1945, but it was only about 80 percent of the 1941–45 median. Each section of the

country reported a very significant increase over the 1945 figure for the same weeks, but only 3 sections, the East North Central, West North Central, and Pacific, reported an increase over the preceding 5-year median. With the exception of 1945, which was an unusually low year for this disease, the current incidence is the lowest since 1940 when approximately 22,000 cases were reported for the corresponding 4-week period.

Meningococcus meningitis.—The number of cases of this disease dropped from 907 during the 4 weeks ended January 27 to 733 for the 4 weeks ended February 23. The number of cases was only about 70 percent of the 1941–45 median, which was represented by the 1945 figure. In the West North Central section the number of cases was slightly above the seasonal expectancy and in the New England section the incidence was about normal, but in all other regions the numbers of cases were considerably below the seasonal median. A decline in this disease during this period is somewhat unexpected since its highest incidence is normally reached during February or March.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Jan. 27–Feb. 23, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period, 1941–45

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,487	1,242	1,158	38,746	17,922	22,139	48,914	8,107	61,200
New England	30	25	23	146	127	127	1,314	606	4,084
Middle Atlantic	169	113	116	133	43	137	13,341	817	19,096
East North Central	307	118	160	1,011	164	495	12,128	635	7,455
West North Central	158	104	97	277	187	235	4,753	371	4,196
South Atlantic	228	185	185	10,003	5,659	6,738	3,298	961	7,041
East South Central	122	118	106	3,016	1,086	2,825	2,494	268	2,975
West South Central	223	338	247	19,712	9,817	9,817	2,669	1,208	2,785
Mountain	74	65	65	1,637	697	1,999	1,934	389	3,215
Pacific	176	176	123	2,811	142	634	6,983	2,852	3,574
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	733	1,034	1,034	143	171	101	13,443	22,910	16,265
New England	41	40	40	3	8	2	1,156	2,036	2,036
Middle Atlantic	153	213	213	15	60	8	3,498	4,599	3,945
East North Central	118	200	151	11	9	9	3,757	5,987	4,801
West North Central	70	62	62	7	14	12	1,393	2,353	1,880
South Atlantic	103	161	161	32	21	14	1,122	2,659	1,293
East South Central	84	107	107	16	15	9	430	967	772
West South Central	72	122	94	17	10	11	506	856	454
Mountain	11	22	22	7	7	7	481	1,303	1,008
Pacific	81	107	107	135	27	21	1,100	2,150	865
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	29	43	102	150	258	258	6,998	9,357	15,061
New England	0	0	0	12	14	12	910	1,141	1,256
Middle Atlantic	1	0	0	12	82	36	1,925	1,905	2,982
East North Central	3	17	17	22	14	29	1,481	1,625	3,151
West North Central	3	4	15	7	18	15	182	385	669
South Atlantic	1	2	2	38	32	43	850	1,246	1,941
East South Central	2	2	5	9	22	24	226	270	580
West South Central	15	11	16	25	43	43	579	1,181	1,181
Mountain	3	2	3	6	12	11	361	531	531
Pacific	1	5	1	19	21	16	484	1,073	1,270

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

Scarlet fever.—Scarlet fever incidence was also below normal, 13,433 cases being reported for the current period as compared with 22,910 for the corresponding period in 1945, and a 5-year median of 16,256 cases. In the West South Central and Pacific sections the incidence was slightly above the normal seasonal level, but in all other regions the numbers of cases were relatively low. For the country as a whole the current incidence was the lowest since 1940 when 19,277 cases were reported for the corresponding period.

Smallpox.—The incidence of smallpox continued at a low level. There were 29 cases reported for the current 4 weeks, as compared with 43 cases during the corresponding period in 1945, and a 5-year median of 102 cases. Fifteen of the total cases were reported from the West South Central region and the remaining 14 were scattered over the other geographic sections. The first case of smallpox to occur in the Middle Atlantic section since 1943 was reported from New Jersey during the week ended February 23.

Typhoid and paratyphoid fever.—The incidence of these diseases was the lowest on record for this period. For the 4 weeks ended February 23 there were 150 cases reported, which was less than 60 percent of the 1941–45 median (258 cases). The situation was favorable in all sections of the country, the cases either closely approximating or falling below the normal seasonal expectancy.

Whooping cough.—There were 6,998 cases of whooping cough reported for the 4 weeks ended February 23. The number was less than 75 percent of the number reported during the corresponding period in 1945 and less than 50 percent of the preceding 5-year median. The incidence was relatively low in all sections of the country.

MORTALITY, ALL CAUSES

For the 4 weeks ended February 23 there were 39,812 deaths from all causes reported by 93 large cities to the Bureau of the Census. The 1943–45 average number of deaths for this period was 39,617.

DEATHS DURING WEEK ENDED FEBRUARY 23, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 23, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	9,470	9,351
Average for 3 prior years	9,820	
Total deaths, first 8 weeks of year	84,000	78,392
Deaths under 1 year of age	595	592
Average for 3 prior years	649	
Deaths under 1 year of age, first 8 weeks of year	4,855	5,063
Data from industrial insurance companies:		
Policies in force	67,171,224	67,066,872
Number of death claims	12,300	11,945
Death claims per 1,000 policies in force, annual rate	9.5	9.3
Death claims per 1,000 policies, first 8 weeks of year, annual rate	11.2	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 2, 1946

Summary

The incidence of influenza declined during the week to a total of 5,337 cases as compared with 7,234 last week and a 5-year (1941–45) median of 5,249. Increases occurred in only 3 States reporting currently more than 200 cases—Wisconsin, Arizona, and California. The largest numbers were reported in Texas (1,792), South Carolina (711), and Virginia (430). The total to date is 160,350, as compared with 39,166 and 306,514, respectively, for the corresponding periods of 1945 and 1944, and a 5-year median for the period of 44,521.

A total of 362 cases of diphtheria was reported, as compared with 337 last week and a 5-year median of 270. Increases occurred in 5 of the 7 States reporting more than 14 cases each, as follows: Texas 49, Ohio 32, Kentucky 20, New York 19, and Indiana, Arkansas, and California, 18 each. The total to date, 3,573, is more than reported for a corresponding period of any other year since 1940, in which year 3,716 cases had been reported.

A total of 24,790 cases of measles was reported, as compared with 15,725 last week and a 5-year median of 18,496. Increases were reported in all sections of the country except the West South Central area. The greatest increases, as well as about 72 percent of the total number of cases, occurred in the Middle Atlantic, East North Central, and Pacific areas. The 6 States reporting more than 900 cases each, aggregating 15,497 cases, are as follows (last week's figure in parentheses): New York 4,228 (1,469), New Jersey 1,259 (689), Pennsylvania 2,869 (1,614), Illinois 1,888 (1,483), Michigan 2,867 (2,103), California 2,386 (1,362). The total to date is 93,989, as compared with a 5-year median for the period of 114,932.

Of a total of 202 cases of meningococcus meningitis, Pennsylvania reported 24, Illinois 23, New York 18, California 16, and Ohio 12. Of 52 cases of poliomyelitis, Florida reported 17, Washington 7, and California 6,

Deaths recorded during the week in 93 large cities of the United States totaled 10,371, as compared with 9,474 last week, 9,866 and 9,852, respectively, in 1945 and 1944, and a 3-year (1943–45) average of 9,850. The total for the year to date is 94,375, as compared with 88,258 for the corresponding period of 1945.

Telegraphic morbidity reports from State health officers for the week ended Mar. 2, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945	
NEW ENGLAND												
Maine	1	0	1	30	1	1	10	4	88	4	0	2
New Hampshire	0	0	0	------	------	4	------	------	6	1	1	0
Vermont	4	0	0	10	------	------	2	20	47	0	0	0
Massachusetts	6	4	4	------	------	------	446	104	597	2	8	11
Rhode Island	1	0	0	2	44	1	6	8	27	0	4	4
Connecticut	1	1	1	4	3	3	107	94	259	3	3	4
MIDDLE ATLANTIC												
New York	19	11	18	[1] 8	[1] 3	[1] 12	4,228	90	2,040	18	34	34
New Jersey	3	1	3	15	3	11	1,259	47	1,299	2	13	13
Pennsylvania	13	11	11	5	2	2	2,869	116	976	24	19	19
EAST NORTH CENTRAL												
Ohio	32	8	8	11	5	18	156	35	292	12	11	6
Indiana	18	8	9	5	40	40	529	12	320	2	4	4
Illinois	14	2	14	8	8	23	1,888	83	835	23	20	15
Michigan [2]	7	10	4	2	2	2	2,867	22	241	8	5	5
Wisconsin	0	0	0	310	59	59	729	33	668	2	5	4
WEST NORTH CENTRAL												
Minnesota	8	7	4	2	1	1	25	4	58	6	3	3
Iowa	4	2	3	------	------	10	45	16	298	3	1	1
Missouri	8	4	4	7	4	6	560	9	255	4	7	7
North Dakota	3	0	0	11	40	40	2	1	53	2	1	0
South Dakota	1	1	1	------	------	------	83	35	35	0	0	0
Nebraska	1	2	3	19	------	7	114	18	56	0	0	0
Kansas	7	8	6	1	1	9	875	13	428	2	2	2
SOUTH ATLANTIC												
Delaware	3	0	0	------	------	------	22	20	20	2	0	0
Maryland [2]	9	5	5	4	12	29	232	59	115	6	5	5
District of Columbia	0	0	2	1	1	3	124	8	67	0	1	2
Virginia	5	6	6	430	616	652	591	45	338	6	10	10
West Virginia	5	1	4	12	16	43	42	28	229	2	1	1
North Carolina	10	12	12	------	------	52	323	42	490	6	8	8
South Carolina	5	2	2	711	984	984	284	24	192	1	4	5
Georgia	0	4	5	30	21	144	224	27	200	2	5	4
Florida	2	3	3	4	2	5	53	47	165	7	10	5
EAST SOUTH CENTRAL												
Kentucky	20	5	5	173	35	35	648	19	205	3	8	8
Tennessee	4	3	3	47	43	108	242	83	185	6	7	7
Alabama	6	8	3	308	198	232	135	10	148	4	2	2
Mississippi [2]	12	12	4	------	------	------	------	------	------	5	3	3
WEST SOUTH CENTRAL												
Arkansas	18	10	4	223	155	174	70	27	126	3	8	1
Louisiana	1	2	4	140	2	8	23	15	85	1	1	3
Oklahoma	10	6	6	198	233	209	155	23	34	2	1	1
Texas	49	41	37	1,792	1,415	1,634	574	431	620	5	23	6
MOUNTAIN												
Montana	7	1	1	12	24	25	11	6	90	0	0	0
Idaho	2	4	0	54	------	------	86	7	26	1	0	0
Wyoming	0	0	0	------	------	14	12	8	77	1	1	1
Colorado	3	8	7	91	35	64	275	14	207	1	0	1
New Mexico	0	2	2	9	8	8	9	3	47	0	2	0
Arizona	2	1	1	213	66	181	48	3	111	0	3	1
Utah [2]	0	0	0	60	1	20	512	124	93	0	1	0
Nevada	0	0	0	------	3	3	13	7	5	0	0	0
PACIFIC												
Washington	11	5	4	------	2	3	687	84	150	3	3	3
Oregon	9	2	1	14	13	29	229	42	142	1	1	1
California	18	30	20	361	40	87	2,386	843	843	16	18	18
Total	362	253	270	5,337	4,141	5,249	24,790	2,813	18,496	202	267	267
9 weeks	3,573	2,880	2,750	160,350	39,166	44,521	93,989	16,310	114,932	1,844	2,254	2,254

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Mar. 2, 1946, and comparison with corresponding week of 1945 and 5-year median—Continued.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945		Mar. 2, 1946	Mar. 3, 1945	
NEW ENGLAND												
Maine	0	0	0	65	62	7	0	0	0	1	1	0
New Hampshire	0	0	0	35	6	8	0	0	0	0	0	0
Vermont	0	0	0	2	11	8	0	0	0	0	0	0
Massachusetts	1	0	0	198	322	322	0	0	0	5	2	1
Rhode Island	0	0	0	13	47	17	0	0	0	0	1	0
Connecticut	0	0	0	53	81	61	0	0	0	1	0	1
MIDDLE ATLANTIC												
New York	2	1	1	596	719	548	0	0	0	5	5	6
New Jersey	1	1	1	144	175	199	0	0	0	1	0	1
Pennsylvania	0	0	0	407	651	563	0	0	0	1	9	5
EAST NORTH CENTRAL												
Ohio	1	1	1	350	498	399	0	0	0	0	2	2
Indiana	0	0	0	103	188	170	2	1	1	2	1	1
Illinois	0	2	0	269	453	453	0	0	1	5	4	2
Michigan [2]	0	0	0	166	259	259	0	0	0	0	1	1
Wisconsin	1	0	0	166	280	280	0	0	0	0	1	0
WEST NORTH CENTRAL												
Minnesota	0	1	0	61	96	96	0	0	[illegible]	0	0	0
Iowa	0	2	0	71	65	65	0	1	1	0	0	0
Missouri	0	2	0	77	173	117	0	0	0	0	1	1
North Dakota	0	0	0	3	19	19	0	0	0	0	0	0
South Dakota	0	0	0	23	11	21	0	1	1	1	0	0
Nebraska	0	0	0	43	93	67	1	1	0	0	0	0
Kansas	0	0	0	90	120	102	0	2	0	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	8	18	15	0	0	0	0	0	0
Maryland [2]	0	0	0	119	284	91	0	0	0	0	0	1
District of Columbia	1	0	0	25	61	26	0	0	0	0	0	0
Virginia	3	2	1	135	174	42	0	0	0	4	1	1
West Virginia	0	0	0	36	58	57	0	0	0	0	0	0
North Carolina	0	3	1	42	90	45	0	0	0	0	3	0
South Carolina	3	0	0	9	9	9	0	0	0	0	1	0
Georgia	0	0	0	13	31	17	0	1	0	2	6	3
Florida	17	0	1	7	14	12	0	0	0	0	1	2
EAST SOUTH CENTRAL												
Kentucky	1	2	0	31	89	89	0	0	0	3	1	2
Tennessee	0	0	1	44	67	67	0	0	0	2	0	2
Alabama	0	0	1	16	20	20	0	0	0	0	0	0
Mississippi [2]	0	0	0	3	54	10	0	0	0	2	0	0
WEST SOUTH CENTRAL												
Arkansas	1	2	1	14	26	6	0	0	0	1	1	1
Louisiana	2	1	1	2	15	11	0	0	0	2	0	1
Oklahoma	0	0	0	17	27	27	0	0	0	0	0	0
Texas	1	2	1	74	136	79	1	0	2	3	3	4
MOUNTAIN												
Montana	4	1	0	10	43	35	0	0	0	0	0	0
Idaho	0	0	0	8	57	6	0	1	0	0	0	0
Wyoming	0	0	0	17	8	14	0	0	0	0	0	0
Colorado	0	0	0	44	92	53	0	0	0	2	0	2
New Mexico	0	0	0	5	30	10	0	0	0	0	1	1
Arizona	0	0	0	14	25	13	0	0	0	0	1	1
Utah [2]	0	0	0	29	38	38	0	0	0	0	0	0
Nevada	0	0	0	0	5	2	0	1	0	0	0	0
PACIFIC												
Washington	7	0	0	38	120	66	0	0	0	0	0	0
Oregon	0	0	0	26	53	14	0	0	0	0	0	1
California	6	3	2	227	452	144	1	0	0	3	0	2
Total	52	26	19	3,948	6,425	4,357	5	9	16	47	47	56
9 weeks	405	340	247	28,330	48,347	34,622	63	86	191	367	525	630

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Massachusetts 5; Connecticut 1; New York 1; Louisiana 1; Colorado 1; California 1.

Telegraphic morbidity reports from State health officers for the week ended Mar. 2, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Mar. 2, 1946	Whooping cough: Week ended— Mar. 3, 1945	Whooping cough: Median 1941–45	Week ended Mar. 2, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	26	51	28								1
New Hampshire			12								
Vermont	7	43	35								2
Massachusetts	120	175	175		9						
Rhode Island	58	33	33								
Connecticut	82	37	40	2							
MIDDLE ATLANTIC											
New York	168	234	341	4	4		1		1		2
New Jersey	140	103	107	1							1
Pennsylvania	113	171	227								
EAST NORTH CENTRAL											
Ohio	51	135	177								1
Indiana	25	13	29	1		1			1		
Illinois	77	85	85	4					2		20
Michigan [2]	138	49	130	1	2						1
Wisconsin	81	63	104								10
WEST NORTH CENTRAL											
Minnesota	1	39	43	1							8
Iowa	14	9	18	1			1				
Missouri	3	7	12								
North Dakota		1	14								
South Dakota		4	4								1
Nebraska	2	2	6								
Kansas	37	44	58				1				
SOUTH ATLANTIC											
Delaware	7										
Maryland [2]	19	38	54			1					2
District of Columbia	6	2	11								
Virginia	37	36	55			33					
West Virginia	48	62	53								
North Carolina	32	116	178						2	1	
South Carolina	52	54	61	2	5					2	
Georgia	25	20	37	4						3	1
Florida	6	29	23	1	1						1
EAST SOUTH CENTRAL											
Kentucky	15	44	51						1		
Tennessee	4	19	26						4		
Alabama	10	13	13	1			1		1	4	2
Mississippi [2]										2	
WEST SOUTH CENTRAL											
Arkansas	16	16	16				1				1
Louisiana	2	1	2	2						1	
Oklahoma	4	11	11	1							
Texas	95	215	215	12	170	12				8	4
MOUNTAIN											
Montana	6	1	6						2		1
Idaho	14		9	1							
Wyoming	1	5	2								
Colorado	29	30	30								1
New Mexico	6	17	17		1						
Arizona	16	23	23			16					1
Utah [2]	18	17	23								
Nevada											
PACIFIC											
Washington	46	38	55								1
Oregon	10	4	13								
California	98	284	284	2	3					1	8
Total	1,765	2,393	3,907	41	195	63	5	0	14	22	70
Same week, 1945	2,393			22	385	265	7	0	9	32	85
Average, 1943–45	2,760			27	271	125	13	[4] 0	9	[4] 32	
9 weeks: 1946	16,161			363	2,623	1,018	66	3	189	460	573
1945	20,816			244	5,066	1,281	57	4	198	511	760
Average, 1943–45	24,037		[4] 34,878	211	2,923	725	79	[4] 4	148	[4] 412	

[2] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

NOTIFIABLE DISEASES, YEAR 1945

The figures in the following table are the totals of the monthly morbidity reports received from the State health authorities for the year 1945. These reports are preliminary and the figures are therefore more or less incomplete. In most instances they include cases reported in both civilian and military populations. The comparisons made are with similar preliminary reports; but owing to population shifts and the presence of large military populations in certain States, the figures for some States are not comparable with those for prior years, especially for certain diseases. Each State health officer has been requested to include in the monthly report for his State all diseases that are required by law or regulation to be reported in the State, although some do not do so. The lists of diseases required to be reported are not the same for each State. Only 11 of the common communicable diseases are notifiable in all the States. In some instances cases are reported, in some States, of diseases that are not required by law or regulation to be reported, and the figures are included although manifestly incomplete. There are also variations among the States in the degree of completeness of reporting of cases of the reportable diseases. As compared with the deaths, incomplete case reports are obvious for such diseases as malaria, pellagra, pneumonia, and tuberculosis, while in many States other diseases, such as puerperal septicemia, rheumatic fever, and Vincent's infection, are not reportable.

In spite of these known deficiencies, however, these monthly reports, which are published quarterly and annually in consolidated form, have proved of value in presenting early information regarding the reported incidence of a large group of diseases and in indicating a trend by providing a comparison with similar preliminary figures for prior years. The table also gives a picture of the geographic prevalence of certain diseases, as the States are arranged by geographic location.

Leaders are used in the table to indicate that no case of the disease was reported.

Consolidated monthly State morbidity reports for the year 1945

Division and State	Anthrax	Chickenpox	Conjunctivitis [1]	*Diphtheria	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, infectious	German measles	Hookworm disease	Influenza	Malaria [2]	*Measles	*Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENGLAND																		
Maine	....	2,409	....	79	....	....	....	3	215	....	77	28	137	27	2,171	....	1	646
New Hampshire	6	578	....	10	1	3	....	....	70	....	106	4	400	18	634	....	....	47
Vermont	....	2,567	....	27	....	....	....	1	1,426	....	273	4	466	8	3,590	....	....	55
Massachusetts	4	10,400	301	207	18	244	....	24	1,311	5	....	1,028	7,488	187	15,728	191	....	[3] 2,186
Rhode Island	....	1,271	....	12	1	26	....	6	19	....	1,461	168	274	41	1,363	....	....	419
Connecticut	1	5,593	90	49	4	230	....	4	581	10	121	300	2,710	109	5,204	1	....	2,482
MIDDLE ATLANTIC																		
New York	4	21,495	1	420	176	886	....	50	....	....	[4] 331	1,234	5,195	848	[4] 5,204	61	....	16,380
New Jersey	2	21,083	....	139	53	8	48	8	2,605	....	648	1,413	1,756	283	7,689	14	....	3,852
Pennsylvania	18	20,767	....	416	8	16	....	12	....	....	251	....	11,304	529	12,192	14	2	3,158
EAST NORTH CENTRAL																		
Ohio	1	11,699	....	774	13	13	20	13	930	....	839	110	1,555	400	4,315	493	1	2,609
Indiana	....	2,894	10	401	26	4	41	17	170	2	5,088	643	890	153	2,087	....	2	335
Illinois	....	10,523	....	195	150	128	....	57	1,001	2	923	13	7,930	611	7,202	480	....	6,576
Michigan	....	15,817	206	654	56	131	3	....	1,182	1	114	473	6,308	270	8,081	28	....	2,365
Wisconsin	....	24,668	....	108	6	....	....	4	[5] 388	....	5,481	188	2,297	148	16,549	....	....	[3] 769

WEST NORTH CENTRAL																		
Minnesota		7,127	1	474	96	12	17	6		2	90	296	387	110		1		275
Iowa		2,472		226	5			5	39		660	465	1,279	91	2,768		2	1,181
Missouri		1,419	2	276			27	7	66		345	426	815	269	1,678			1,527
North Dakota	1	856	3	122	1		1	7			4,561	1	119	18				808
South Dakota		815	2	96			1	1			28	7	502	35	324			117
Nebraska		1,617		132				2			1,666	13	833	24	1,193			427
Kansas		4,541	140	291	7	10	1	19	670		31,487	781	1,311	70	6,413		1	962
SOUTH ATLANTIC																		
Delaware		215		22	1	3					41	47	261	18	227			31
Maryland		3,503	31	503	9	27	34		540		476	586	1,088	122	2,369	18	1	2,158
District of Columbia		1,104		22	2	9		2			98	144	203	58	304		1	910
Virginia		2,763		577	13		7,098	1			31,460	832	1,626	216	1,021		9	2,654
West Virginia		933		308	22	4		4			18,821	175	848	118	278			285
North Carolina				1,475	21	57		5				554	1,194	179				
South Carolina		2,440		627	127	1,370			546	1,131	27,915	9,860	1,146	69	3,441	35	775	4,960
Georgia	1	1,462	33	659	30	190	38	1		3,792	3,381	915	639	95	984		31	702
Florida		1,993	26	240	96	26	6	5	176	5,317	152	655	702	167	1,350	21	5	1,114
EAST SOUTH CENTRAL																		
Kentucky		1,162		426	8	26		3	33		119,666	1,071	1,691	163	790		5	779
Tennessee		1,318		681	17		116	18	113	2	2,746	191	1,717	250	1,787	17	40	1,914
Alabama		1,004		698	72			8	795		7,339	2,913	349	218	1,407		28	3,050
Mississippi		7,568		749	1,224	9,939				5,262	64,855	18,764	11,891	148	7,548	48	2,062	15,331
WEST SOUTH CENTRAL																		
Arkansas		1,311		506	114	347		3	995	33	8,073	2,262	1,307	178	1,817		25	2,533
Louisiana	1	585		459	150	115		2	125	629	8,129	1,327	1,096	117	407	53	9	2,587
Oklahoma		636		259	27	133	8	5		6	6,757	1,141	937	66	763	1	17	1,294
Texas	2	15,200		2,481	580	20,226	1,966	16			94,558	8,969	11,040	458	9,527	88	790	11,802
MOUNTAIN																		
Montana		2,483	202	80	1	7	1	3	216		2,401	32	499	22	1,531			300
Idaho	2	1,082	35	66	4	16	12	5	107		2,865	39	1,636	14	459			154
Wyoming		708	92	14	4		41		42		380	7	269	8	217			129
Colorado		4,456		284	11	16		8	49		3,491	[6] 830	832	48	2,155			1,091
New Mexico		448	20	181	14	105	49	1	28		111	70	262	18	353		10	732
Arizona		1,457	12	126	11	4	1,045	7	242		7,223	189	340	24	619	7	20	1,308
Utah		5,380	4	18	1			1	558		32,036	112	4,788	14	3,795			218
Nevada		206	15	1	2	2	9				539	5	333	3	301			67
PACIFIC																		
Washington		8,357	72	290	7	51	496	20	1,354		6,175	6	7,267	135	7,776			1,303
Oregon		2,443	3	282	1	1	47	2			5,825	54	1,980	61	1,563			649
California	1	43,737	28	1,458	151	287		208	12,480		1,426	1,011	34,441	790	39,014			[3] 3,416
Total	44	284,625	1,329	18,606	3,341	34,672	11,125	673	29,222	16,194	511,489	61,256	144,398	8,035	196,317	1,571	3,837	108,777
Year 1944	39	317,510	1,492	14,122	3,220	37,525	9,421	667	38,339	16,104	476,275	55,693	623,709	16,094	175,643	1,649	4,483	129,021
Median, 1940–44	75	299,985		16,252	3,175	24,281	7,538	740	130,417	20,971	452,101	58,917	612,068	3,758	198,264	1,627	6,051	141,939
Alaska		301		40		6	18		15		656		110	4	53			55
Hawaii Territory		1,171	52	31	84	266		1	284	241	9,945	210	3,768	34	508			[5] 111
Panama Canal Zone [7]		155		114	44	43						775	59	7	54			[8] 420

See footnotes on page 425.

Consolidated monthly State morbidity reports for the year 1945—Continued

Division and State	*Poliomyelitis	Rabies in man	Rheumatic fever	Rocky Mountain spotted fever	*Scarlet fever	Septic sore throat	*Smallpox	Tetanus	Trachoma	Trichinosis	*Tuberculosis, all forms	Tuberculosis, respiratory	Tularemia	*Typhoid and paratyphoid fever	Paratyphoid fever	Typhus fever, endemic	*Undulant fever	Vincent's infection	*Whooping cough
NEW ENGLAND																			
Maine	75				1,807	16		4		6	510	474	1	34	5		47	24	2,159
New Hampshire	30				883	58		1			135			4			9	8	480
Vermont	50				410	47					30			5	1		76	75	1,470
Massachusetts	538				10,387	198		12	1	29	2,907	2,742		144	125		50		7,444
Rhode Island	9		156		864	27				1	859	708		15	8		21	4	988
Connecticut	217			1	2,144	353		5		13	1,294	1,241		36	5	1	125		2,420
MIDDLE ATLANTIC																			
New York	1,812	1		17	19,870			24		121	12,917	12,042	4	225	46	18	279		13,477
New Jersey	949			15	4,251	106		8	2	27	3,379		2	92	15	6	70		7,251
Pennsylvania	743	1	916	10	15,084			5		2	3,749		7	368		2	127		9,179
EAST NORTH CENTRAL																			
Ohio	460	2	34	3	12,797	61	8	12	15	6	5,789	5,622	12	160	24	6	79	17	7,742
Indiana	203	2	4	16	4,276	76	50	16	11		3,050	2,882	11	84	2		58	159	1,064
Illinois	1,098	3	243	18	10,547	224	13	20	49	1	6,148	5,454	114	113	23	1	325	178	4,108
Michigan	218		344		9,384	407	16	21	1	2	5,466		4	132	71		250		5,340
Wisconsin	607				6,843	208	12		3		2,527		10	17			283		3,347
WEST NORTH CENTRAL																			
Minnesota	243		44		3,028	319	3	6			[9] 1,378		9	20	3		312	87	842
Iowa	320		8	2	2,228	20	10		3		774	[10] 500	5	40	1		482	55	275
Missouri	297	1	80	5	3,052	13	12		194		2,111		33	81			55		920
North Dakota	15		15		807	20	10	1	15		201	191		21	1		13	60	95
South Dakota	20			1	553	5	6		34		318			12	1	1	44	6	151
Nebraska	120				2,467		11				449			5			4		192
Kansas	132	1	5	4	3,524	33	17	6	4	7	661	620	17	31		2	209	117	1,475
SOUTH ATLANTIC																			
Delaware	31			3	291			2			196	185		18		1	1		105
Maryland	107		164	38	5,054	166		6		4	3,161	3,067	16	43	5	[11] 1	13	44	2,629
District of Columbia	141			2	1,386						1,777	1,649	1	25	2	1	2		410
Virginia	338			93	4,118	2,376	1	17			3,072	8,072	50	171	12	20	33		2,933
West Virginia	66			12	2,646	19					1,836		1	86	2	2	12		1,175
North Carolina	160	2		59	3,244	101	1		1		3,396	3,209	27	92	5	160	15		5,834
South Carolina	189	1	514	6	491	41	2	4			776		12	132	24	216	25		3,534
Georgia	123	3	[12] 216	19	1,180	212	10	18		3	1,691	1,685	58	235	69	1,110	165	114	807
Florida	144				328	47		30			1,105	1,005	8	158	32	380	27	115	460

EAST SOUTH CENTRAL																			
Kentucky	67	1		18	2,292	35	5		19		2,330	2,281	80	189	4	1	20	6	1,924
Tennessee	439			17	2,335	202	8	30	1	1	3,899		69	298	8	75	45	207	1,272
Alabama	153	1		9	929		5	36	1		2,690		15	146	17	601	104		1,073
Mississippi	80				1,047		25		56		1,622	1,592	59	101		235	100		7,232
WEST SOUTH CENTRAL																			
Arkansas	63	1		3	855	981	31	6	390		1,182	918	102	143	4	24	51		666
Louisiana	129	3	333	1	732	929	8	58			2,424	2,310	22	176	13	417	77		296
Oklahoma	197			24	986	181	11	8	173		2,127		16	92	8	1	37	15	677
Texas	995	1			4,605	1,562	9		159		6,708		20	578	71	1,833	616		10,308
MOUNTAIN																			
Montana	81		36	2	699	141	4	1	28		398	163	9	52	14		9	35	341
Idaho	24		31	6	1,176	196	13	1	1	1	289	[12] 106	2	39			24	82	383
Wyoming	24		1	14	422	69	2				47		14	9	2		4	3	172
Colorado	146		223	14	2,235	252	5				669		1	58	7		63	174	1,672
New Mexico	24			1	844	59	4		10		2,839	2,765	2	92	5		6		374
Arizona	24		6		988	11	6		219		1,298			44	1		13	2	846
Utah	253		201	8	1,252	4	3		1		154	146	27	19	6		99		1,182
Nevada	11		2	4	133	57	4		12		150		4	4			3	42	59
PACIFIC																			
Washington	327		231	1	2,863	175	8	1	3	6	2,648		3	59	18		54	259	1,350
Oregon	69		3	6	1,286	105	6	2	2	13	695	[14] 252		40	4		153	[13] 47	771
California	938	1	971		14,496		7	69	40	14	11,462	10,806	9	190	52	65	270		13,832
Total	13,514	25	4,781	452	174,128	10,112	346	439	1,448	257	115,299	67,786	856	4,937	716	5,180	4,959	1,935	132,814
Year 1944	19,053	52	2,454	448	191,220	7,356	384	406	2,545	357	126,348	70,462	733	5,388	741	[15] 5,353	4,286	2,614	109,285
Median, 1940–44	9,781	31		431	142,274	7,787	864	412	2,778	357	106,372	63,664	900	6,602		3,725	3,408	2,167	191,112
Alaska			13		7	23					410	308	1	4				3	29
Hawaii Territory	15				140	75		16	4		914	825		25	18	104	8		
Panama Canal Zone [7]	7				4						[8] 55	[8] 50		30	28	1			[8] 30

*Diseases marked with an asterisk (*) are reportable by law or regulation in all the States, including the District of Columbia. Typhoid fever is reportable in all the States; paratyphoid fever in all except 6 States. Syphilis is reportable in all the States and the District of Columbia but is not included in the table. Chickenpox, conjunctivitis, influenza, and pellagra were dropped from the list of reportable diseases in North Carolina in 1945. Rheumatic fever has been made reportable in Louisiana.

[1] Includes cases of kerato- and suppurative conjunctivitis and of pink eye.
[2] In some States practically all in the military.
[3] Lobar pneumonia only.
[4] New York City only.

See notes on page 426.

[5] For 4 months only.
[6] Exclusive of prisoners of war.
[7] Includes the cities of Colon and Panama.
[8] In the Canal Zone only.
[9] Includes nonresidents.
[10] For 7 months only.
[11] Tsutsugamushi fever.
[12] Includes 194 cases reported from U. S. naval hospital at Dublin, Ga.
[13] For 3 months only.
[14] For 6 months only.
[15] Includes 1 case of tsutsugamushi fever.

The following list includes certain rare conditions, diseases of restricted geographical distribution, and those reportable in or reported by only a few States; last year's figures in parentheses:

Actinomycosis: New Hampshire 1, Massachusetts 2 (1), Connecticut, 3 (1) Pennsylvania (1), Illinois 1 (6), Michigan 5 (5), Minnesota 11 (25), Iowa 1 (1), Missouri (1), South Dakota (1), Kansas 3 (2), Maryland (1), Tennessee (1), Montana 1 (1), Washington 1.

Botulism: New York 1 (4), Illinois 1 (1), Arizona 4, Utah 7, Nevada (2), Washington (6), California 25 (8).

Coccidioidomycosis: Kansas (1), New Mexico 4 (1), Arizona 6 (43), California 39 (31).

Dengue: West Virginia 1, South Carolina 19 (10), Georgia 2, Kentucky (2), Alabama (2), Mississippi 10 (2), Arkansas (1), Louisiana 62 (3), Texas 19 (41), Idaho 2, California 1, Hawaii Territory 13 (285).

Dermatitis: New Hampshire 23, Missouri 337, Kansas 1.

Diarrhea: Rhode Island (5), New Jersey 6 (55), Ohio 1,150 (937), (includes enteritis), Indiana 5 (3), Illinois 2 (5), Michigan 15 (55), Minnesota 68 (8), (includes enteritis), South Dakota 4, Maryland 136 (120), South Carolina 12,300 (10,235), Florida 42 (28), Montana 18, Wyoming (1), Colorado 6 (1), (includes enteritis), New Mexico 215 (253), (includes enteritis), Utah 27, Nevada (33), Washington 56 (133), Oregon 6 (includes enteritis), California 43 (48).

Dog bite; New Hampshire 1, Illinois 10,843 (11,164), Michigan 8,389 (7,743), Arkansas 469 (370).

Favus: Michigan (1).

Filariasis: New Jersey 2, Indiana 1 (1), Minnesota, 2.

Food poisoning: Maine 7 (5), Ohio 1 (1), Indiana 9 (14), Illinois 105 (46), Minnesota 33, South Carolina 62, Louisiana 22 (12), Idaho 2, Colorado 51, New Mexico 1 (10), Nevada 6 (6), Washington 78 (3), California 483 (651).

Granuloma, unspecified: Ohio 73 (15).

Granuloma inguinale: Missouri 13 (44), Florida 244 (207), Tennessee 69 (33), Mississippi 618 (653), Louisiana 235 (100), Montana 2, Arizona 3 (10), Washington (47).

Impetigo contagiosa: Ohio 5 (1), Indiana 51 (21), Illinois 75 (87), Michigan 1,224 (1,379), Iowa 8 (9), Missouri 14 (6), North Dakota 5 (32), South Dakota 6 (3), Kansas 55 (97), Maryland 38 (10), Oklahoma 6, Montana 56 (18), Idaho 20, Wyoming 25 (13), Colorado 50 (8), Nevada 121 (12), Washington 806 (174), Oregon 67 (351), Alaska 1 (12), Hawaii Territory 93 (135).

Jaundice (including hepatitis and Weil's disease): Maine 9, Massachusetts 2, New York 1, Ohio 1, Indiana 89 (13), Illinois 339 (34), Michigan 142, Minnesota 16 (2), Iowa 15, Kansas 80 (4), Maryland 20 (8), South Carolina 140 (4), Florida 23 (35), Louisiana 5, Montana 7, Idaho 40 (3), Wyoming 2 (8), Arizona (4), Utah 26 (18), Nevada (1), Washington 84 (47), Oregon 20, California 343 (380), Alaska 22 (95), Hawaii Territory 219 (24).

Lead poisoning: New Hampshire 1, Minnesota (7), New Mexico 1 (1).

Leprosy: Connecticut 1, New York 1 (3), New Jersey 1 (1), Ohio (1), Illinois 2 (1), Wisconsin 3, Minnesota 1, Maryland (1), Florida (3), Louisiana 8 (9), Texas 5 (5), Colorado (1), Nevada (1), Washington 1, California 17 (9), Hawaii Territory 26 (27).

Lymphocytic choriomeningitis: Massachusetts 4, Illinois (2), Minnesota 2, Maryland 6, Tennessee 31 (3), Utah 1.

Lymphogranuloma venereum: Missouri 25 (51), Florida 183 (248), Tennessee 87 (72), Louisiana 170 (165), Arizona 2 (27), Utah 6 (3), Nevada (4).

Plague (human): California (1), laboratory infection, Hawaii Territory 1 (5).

Psittacosis: New York 4, Pennsylvania 5 (2), Ohio 1, Illinois 2, North Dakota 1, Delaware 1, Maryland (1), Virginia 1, Utah (1), Washington (1), California 3 (1).

Puerperal septicemia: Ohio (1), Georgia (2), Florida 1 (2), Tennessee 2 (4), Mississippi 181 (244), Arkansas 5, Louisiana 36 (2), New Mexico 1 (6), Nevada 1 (4), Oregon 1.

Rabies in animals: Maine (1), Massachusetts (1), Rhode Island 1 (1), New York 576 (300), Ohio 785 (400), Illinois 421 (366), Michigan 35 (84), Minnesota (2), Iowa 69 (64), Missouri 35 (34), Kansas 15 (29), Delaware (1), Maryland 38 (73), District of Columbia 109 (148), South Carolina 131 (171), Florida 7 (8), Alabama 600 (191), Arkansas 184 (202), Louisiana 106 (134), Texas 838 (297), Colorado (1), New Mexico 10 (34), Utah 22 (16), Washington (1), Oregon (1), California 581 (909), Alaska 1.

Rat bite fever: Kansas 1 (3), South Carolina 1, Tennessee 1, Louisiana 5, Oklahoma 1.

Relapsing fever: Pennsylvania 1, Kansas 2 (1), Texas 18 (19), New Mexico (1), Arizona (2), Nevada 16 (3), California 5 (8), Panama Canal Zone (1).

Ringworm: New Hampshire (1), Pennsylvania 991 (227), Ohio 4, Indiana 9, Illinois 1,309, Michigan 2,055 (2,777), Minnesota 691, Iowa 8, Missouri 112, Kansas 23, Maryland (1), Montana 11 (3), Idaho 9, Nevada 13, Washington 486 (161).

Scabies: New Hampshire (3), Pennsylvania 114, Ohio 1 (2), Indiana 4 (10), Michigan 883 (949), Iowa (1), Missouri 7 (2), North Dakota 27 (103), South Dakota 7, Kansas 93 (85), Delaware 1, Maryland 28 (1), Oklahoma 1, Montana 100 (41), Idaho 69 (4), Wyoming 7 (41), Nevada 83, Oregon 92 (637), Alaska 1 (21).

Silicosis: Ohio 11 (3), Indiana 2 (14), Missouri 1, Kansas 1, Montana (3), Idaho 3 (2), New Mexico 6 (1), Utah 5 (2), Washington 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 23, 1946

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	1	4	0	8	0	0	3
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	2	0	------	1	62	1	8	0	37	0	0	12
Fall River	0	0	------	0	1	0	0	0	2	0	0	4
Springfield	1	0	------	0	1	0	1	0	12	0	0	1
Worcester	0	0	------	0	16	0	13	0	5	0	0	9
Rhode Island:												
Providence	0	0	1	1	4	0	5	0	1	0	0	18
Connecticut:												
Bridgeport	0	0	------	0	1	0	0	0	4	0	0	1
Hartford	0	0	------	0	2	0	1	0	7	0	0	2
New Haven	0	0	------	0	16	1	1	0	4	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	------	1	41	1	1	0	4	0	0	20
New York	13	2	14	2	505	11	80	1	206	0	0	46
Rochester	0	0	------	0	109	2	4	0	15	0	0	2
Syracuse	0	0	------	0	537	1	0	0	6	0	0	1
New Jersey:												
Camden	1	0	1	1	44	0	4	0	2	0	0	1
Newark	0	0	3	0	242	0	7	0	17	0	0	20
Trenton	0	0	2	0	1	0	3	0	6	0	0	2
Pennsylvania:												
Philadelphia	3	0	5	1	577	2	21	0	46	0	0	15
Pittsburgh	1	0	2	2	2	3	8	0	5	0	0	5
Reading	0	0	------	0	95	0	6	0	1	0	0	13
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	------	2	101	0	8	0	9	0	0	3
Cleveland	2	0	1	0	11	0	10	0	36	0	0	11
Columbus	5	0	2	2	4	0	3	0	6	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	------	0	3	0	2		0	------
Indianapolis	2	0	------	0	312	1	7	0	22	0	0	5
South Bend	0	0	------	0	------	0	0	0	4	0	0	------
Terre Haute	0	0	------	0	------	1	2	0	2	0	0	------
Illinois:												
Chicago	4	0	3	1	1,107	9	30	0	81	0	0	54
Michigan:												
Detroit	3	0	1	1	1,446	4	24	0	52	0	0	44
Flint	0	0	------	0	12	1	3	0	7	0	0	2
Grand Rapids	0	0	------	0	76	0	0	0	1	0	0	10
Wisconsin:												
Kenosha	0	0	------	0	13	0	0	0	5	0	0	------
Milwaukee	0	0	------	0	219	0	2	0	29	0	0	25
Racine	0	0	------	0	2	0	0	0	0	0	0	1
Superior	0	0	------	0	1	0	0	0	2	0	0	3
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	4	0	0	0	1	0	0	6
Minneapolis	1	0	------	0	3	0	5	0	7	0	0	1
St. Paul	3	0	------	0	2	0	6	0	15	0	0	3
Missouri:												
Kansas City	3	0	3	0	------	0	6	0	14	0	0	------
St. Joseph	0	0	------	0	24	0	0	0	0	0	0	------
St. Louis	2	0	2	2	44	6	9	0	14	0	0	2

City reports for week ended Feb. 23, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	---	0	------	0	0	0	0	0	0	------
Kansas:												
Topeka	0	0	----	0	261	0	0	0	8	0	0	2
Wichita	0	0	------	0	63	0	3	0	2	0	0	3
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	---	0	5	0	2	0	1	0	0	------
Maryland:												
Baltimore	13	0	5	1	156	2	16	0	45	0	0	15
Cumberland	0	0	---	0	------	0	0	0	8	0	0	------
Frederick	0	0	---	0	------	0	1	0	0	0	0	------
District of Columbia:												
Washington	1	0	------	0	42	0	9	0	26	0	0	5
Virginia:												
Lynchburg	0	0		0	3	0	0	0	0	0	0	------
Richmond	0	0	15	1	15	0	3	0	9	0	2	1
Roanoke	0	0	----	0	------	0	0	0	1	0	0	------
West Virginia:												
Wheeling	0	0	-----	0	1	0	0	0	0	0	0	4
North Carolina:												
Raleigh	0	0	------	0	14	1	3	0	0	0	0	4
Wilmington	0	0	---	0	4	0	1	0	1	0	0	1
Winston-Salem	0	0	----	0	1	1	3	0	2	0	0	11
South Carolina:												
Charleston	1	0	20	0	16	0	1	0	3	0	0	------
Georgia:												
Atlanta	0	0	2	0	1	0	5	0	4	0	0	------
Brunswick	0	0	------	0	------	0	0	0	0	0	0	------
Savannah	0	0	4	0	2	0	1	1	0	0	0	------
Florida:												
Tampa	1	0	------	0	45	2	1	1	2	0	0	9
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	8	1	32	3	11	0	6	0	0	5
Nashville	0	0	-----	0	17	0	7	1	3	0	0	1
Alabama:												
Birmingham	1	0	13	0	3	1	6	0	3	0	0	1
Mobile	1	0	26	2	------	7	4	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	1	0	------	0	4	0	1	1	2	0	0	------
Louisiana:												
New Orleans	2	0	5	1	3	1	14	0	2	0	0	3
Shreveport	0	0	-----	1	------	0	12	1	2	0	0	------
Texas:												
Dallas	0	1	1	1	1	1	4	0	7	0	1	------
Galveston	1	0	------	1	9	0	3	0	0	0	0	1
Houston	2	0	-----	2	4	0	8	0	1	0	1	------
San Antonio	4	0	13	2	10	0	10	0	0	0	0	3
MOUNTAIN												
Montana:												
Billings	0	0	-----	0	------	0	1	0	0	0	0	1
Great Falls	1	0	-----	0	1	0	0	0	0	0	0	------
Missoula	0	0	------	0	45	0	1	0	0	0	0	1
Idaho:												
Boise	0	0	----	0	6	0	1	0	0	0	0	------
Colorado:												
Denver	1	0	6	1	49	2	13	0	10	0	0	10
Pueblo	0	0	---	0	1	0	2	0	5	0	1	2
Utah:												
Salt Lake City	0	0	------	0	6	0	4	0	3	0	0	3

City reports for week ended Feb. 23, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	1	0	------	0	152	0	3	0	10	0	0	11
Spokane	0	0	------	0	41	0	4	0	6	0	0	3
Tacoma	0	0	------	0	41	0	0	0	1	0	0	4
California:												
Los Angeles	4	0	37	5	112	1	8	0	46	0	0	7
San Francisco	2	0	5	1	162	1	6	1	17	0	0	8
Total	87	3	200	37	6,965	68	458	7	934	0	5	464
Corresponding week, 1945	73	------	78	27	594	------	103	------	1,669	0	13	578
Average, 1941-45	64	------	454	[1] 46	[2] 4,566	------	[1] 504	------	1,616	0	12	822

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia, 1.
Dysentery, amebic.—Cases: New York, 5; St. Louis, 1; Atlanta, 1; Spokane, 1; San Francisco, 1.
Dysentery, bacillary.—Cases: Chicago, 1; Detroit, 1; Roanoke, 1.
Dysentery, unspecified.—Cases: Memphis, 1; San Antonio, 10.
Leprosy.—Case: Galveston, 1.
Tularemia.—Case: New Orleans, 1.
Typhus fever, endemic.—Cases: St. Louis, 1; New Orleans, 2; Dallas, 1; Houston, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1943, 33,901,000)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	7.8	0.0	2.6	5.2	269	7.8	88.9	0.0	212	0.0	0.0	131
Middle Atlantic	9.7	0.9	12.5	3.2	997	9.3	62.0	0.5	143	0.0	0.0	58
East North Central	10.4	0.0	4.3	3.7	2,026	9.8	56.4	0.0	158	0.0	0.0	97
West North Central	19.5	0.0	10.8	4.3	869	13.0	62.8	0.0	132	0.0	0.0	37
South Atlantic	26.8	0.0	77.0	3.3	511	10.0	77.0	3.3	171	0.0	3.3	84
East South Central	11.8	0.0	277.4	17.7	307	64.9	165.3	5.9	71	0.0	0.0	41
West South Central	28.7	2.9	54.5	23.0	89	5.7	149.2	5.7	40	0.0	5.7	20
Mountain	16.2	0.0	48.5	8.1	874	16.2	178.0	0.0	146	0.0	8.1	138
Pacific	11.5	0.0	68.9	9.8	833	3.3	34.4	1.6	131	0.0	0.0	54
Total	13.4	0.5	30.8	5.7	1,074	10.5	70.6	1.1	144	0.0	0.8	72

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—February 2, 1946.—During the week ended February 2, 1946, cases of certain communicable diseases were reported by Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		8		65	342	23	28	36	79	581
Diphtheria		6	6	45	6	4	1		1	69
Dysentery, unspecified					2					2
Encephalitis, infectious					1					1
German measles				15	58	1		3	13	90
Influenza		1,744			167				109	2,020
Measles	3	18	9	366	1,567	7	1	8	58	2,037
Meningitis, meningococcus				3	2					5
Mumps			4	36	174	38	10	71	105	438
Scarlet fever		11	9	45	74	6	4	16	20	185
Smallpox							2			2
Tuberculosis (all forms)		3	4	89	49	5		33	22	205
Typhoid and paratyphoid fever				4	3				2	9
Undulant fever				1						1
Venereal diseases:										
Gonorrhea		18	7	97	198	42	57	51	93	563
Syphilis	1	22	6	126	184	9	17	9	36	410
Whooping cough		10		62	29	7				108

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseeses for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Algeria—Oran.—For the week ended March 2, 1946, 1 fatal case of plague was reported in the port of Oran, Algeria.

Egypt—Suez.—For the week ended January 12, 1946, 3 fatal cases of plague were reported in Suez, Egypt. All necessary precautions are stated to have been taken.

Smallpox

British East Africa.—Smallpox has been reported in British East Africa as follows: Kenya—week ended February 9, 1946, 124 cases, 8 deaths; Tanganyika—week ended January 26, 1946, 83 cases, 31 deaths.

Dahomey.—For the period February 11–20, 1946, 191 cases of smallpox were reported in Dahomey.

Indochina (French)—Laos State.—For the week ended February 19, 1946, 9 cases of smallpox with 1 death were reported in Laos State, French Indochina.

Morocco (French).—For the period February 11–20, 1946, 144 cases of smallpox were reported in French Morocco, including cases reported by regions as follows: Agadir and Frontier districts, 16; Casablanca, 35; Fez, 6; Marrakech, 65; Meknes, 13; Oujda, 3; Rabat, 6.

Sudan (French).—For the period February 11–20, 1946, 109 cases of smallpox were reported in French Sudan.

Typhus Fever

Belgian Congo.—For the week ended February 9, 1946, 112 cases of typhus fever were reported in Belgian Congo.

Egypt.—For the week ended January 26, 1946, 52 cases of typhus fever were reported in all of Egypt.

Morocco (French).—For the period February 11–20, 1946, 198 cases of typhus fever were reported in French Morocco, including cases reported by regions as follows: Agadir and Frontier districts, 11, Casablanca, 68, Marrakech, 29, Meknes, 28, Fez, 30, Oujda, 1, Rabat, 31.

Turkey.—For the week ended February 23, 1946, 83 cases of typhus fever were reported in Turkey, including cases reported in ports as follows: Antalya, 1, Amir, 1, Balikesir, 1, Icel, 1, Istanbul, 8, Kocaeli, 1, Samsun, 1, Sinop, 1.

Yellow Fever

French Equatorial Africa—Chad Territory—Logone Department—Moundou.—The case of suspected yellow fever in Moundou, Logone Department, Chad Territory, French Equatorial Africa published on page 371 of the PUBLIC HEALTH REPORTS of March 8, 1946, has not been confirmed.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Public Health Methods, pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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CEREBROSPINAL MENINGITIS

A CHRONOLOGICAL RECORD OF REPORTED CASES AND DEATHS

By MARY GOVER, *Statistician*, and GLEE JACKSON, *Senior Statistical Clerk, United States Public Health Service*

The reported incidence of meningococcus meningitis in the United States reached a record high in 1943, followed by an almost equally high level in 1944. During the current and three prior epidemics of meningococcus meningitis which have been recorded for this country, the reported case rate was 7.5 in 1918, 9.6 in 1929, 5.5 in 1936, and 14.1 per 100,000 in 1943.

Although epidemics of meningitis are not limited to wartime they are known to accompany war and the mobilization of troops. Reports of outbreaks in the United States are recorded in histories of the War of 1812, the Mexican War, and the Civil War. United States Army records (*12*) show that "the incidence rate in the Army increased noticeably in 1907 at the time of the Cuban occupation, in 1913 during the mobilization on the Mexican border, and again in 1917 and 1942 when the United States entered the first and second World Wars."

The annual number of deaths from cerebrospinal meningitis is not large; during the past decade, 1930–39, the number in the United States was approximately the same as from scarlet fever, less than from measles, whooping cough, or diphtheria, and more than those caused by poliomyelitis.[2] The current epidemic is relatively high judged by

[1] From the Division of Public Health Methods.

[2] Number of deaths in the 10-year period, 1930–39, reported in the Registration Area as due to the following causes:

10-year period	Measles	Scarlet fever	Whooping cough	Diphtheria	Polio-myelitis	Cerebrospinal (meningococcus) meningitis
	Number of deaths					
1930–39	30,281	21,670	47,875	40,230	10,484	21,246

the number of reported cases, 3,356 in 1942 and 16,491 in 1943 contrasted with 10,212 cases in 1929 (40 States). The number of deaths from meningococcus meningitis during 1943, however, was only 2,621 compared with 5,651 in 1929 (40 States), the use of sulfonamide drugs having greatly reduced the fatality of the disease. The prophylactic use of sulfonamide drugs has also proved effective in the reduction of carriers and the prevention of cases in Army camps.

Hirsh (*4*), from a study of medical literature, and Bruce-Low (*1*), from statistical reports of cases and deaths, have traced the occurrence of epidemic meningitis from about 1805 to 1915 throughout the world. The years 1915 to 1930 include two major epidemics in the United States; one in 1917–18 associated with World War I, and a later epidemic rise which reached its peak in 1929. Hedrich (*3*), has summarized the reported cases and deaths for this period in the United States and foreign countries reporting numbers of current cases of communicable disease to the League of Nations.

Reported cases of cerebrospinal meningitis.—Cases of cerebrospinal meningitis in the United States are reported by physicians either directly to State health departments, or through local health officers. In all except eight[3] of the States meningitis (epidemic cerebrospinal) has been reportable by law since 1919 or earlier, and in all States since 1932 (*2*). Moreover, all State health departments, since approximately 1915 or earlier, have maintained laboratories and provided clinical and diagnostic service to private physicians and local health officers (*8*). To what extent a diagnosis of meningococcus meningitis is confirmed by a laboratory report is unknown and undoubtedly varies throughout the different States.

Since 1913 a varying number of State health departments have forwarded monthly reports of cases and deaths from communicable disease to the United States Public Health Service (*15*); 20 States reported in 1913, and all States reported from 1928 on. It has been possible to select 40 States which have furnished continuous reports of cerebrospinal meningitis from 1926 on, and to compute rates for an expanding number of States from 1916 to 1925 (see table 2, footnote 1).

Classification of deaths from meningitis.—Cerebrospinal meningitis has been recorded as a cause of death in this country since approximately 1870 and occurs in the State records of New York and Massachusetts, for example. Howard (*5*) records deaths from cerebrospinal meningitis for Baltimore from 1872 and states that prior to that time "meningitis of various types was probably classified for the most part under such indefinite headings as inflammation of the brain, dropsy of the brain, and convulsions." Since 1900 deaths

[3] Georgia, Kentucky, Missouri, New Mexico, North Dakota, Oklahoma, Tennessee, and Wyoming.

have been classified according to the International List of Causes of Death.

The International List has undergone five revisions but no changes of consequence have occurred in the method of distributing deaths from meningitis until the 1938 revision (*13*). However, there has been some obscurity in the classification of deaths from meningitis and therefore the procedure will be given in more or less detail. Related titles for meningitis through all International List revisions are given in footnote 1 to table 1.

Tuberculous meningitis has always been a separate International List title grouped with tuberculosis of specified organs. According to the 1900 classification, only two groups of meningitis other than tuberculous meningitis were tabulated, namely, a total of meningitis and a subdivision or "epidemic cerebrospinal meningitis." Simple meningitis, tabulated separately since the 1909 revision, comprises meningitis not recorded as cerebrospinal or stated to be due to some organism other than the meningococcus. This group includes such diagnoses as pneumococcic, streptococcic, or purulent meningitis, and also meningitis unqualified. Cerebrospinal meningitis, according to the 1909, 1920, and 1929 revisions, was roughly divided into epidemic and nonepidemic categories designated as (*a*) cerebrospinal fever, meningococcus meningitis or epidemic cerebrospinal meningitis, and as (*b*) cerebrospinal meningitis, undefined, or nonepidemic cerebrospinal meningitis, in the three revisions, respectively. In the above three revisions cerebrospinal meningitis, unqualified, was classified as nonepidemic cerebrospinal meningitis. Cerebrospinal meningitis in the 1938 revision is subdivided as due or not due to the meningococcus; cerebrospinal meningitis unqualified being classified with meningococcus meningitis. Other items of less importance numerically have also been transferred to meningococcus meningitis. For convenience, in this study, the two subdivisions of cerebrospinal meningitis have been called (*a*) cerebrospinal (meningococcus) meningitis and (*b*) cerebrospinal meningitis not due to meningococcus.

A tabulation made by the Division of Vital Statistics, Bureau of the Census (*14*), of deaths in 1940 according to both the 1938 and 1929 revisions shows 694 deaths attributed to cerebrospinal (meningococcus) meningitis when classified by the 1938 revision and 582 by the 1929 revision. The transfer of terms from one International List title to another amounts to an increase of 19.2 percent in the rate for cerebrospinal (meningococcus) meningitis according to the 1938 revision compared with the rate based on the prior classification. Data from the Bureau of the Census show that 98.5 percent comparability in classification can be obtained if the two subdivisions of cerebrospinal meningitis in the 1929 and earlier revisions are combined for comparison with cerebrospinal (meningococcus) meningitis in the 1938 revision.

TABLE 1.—*Mortality from meningitis* [1] *in the Death Registration States of the United States, 1900–43*

Year	Tuberculous meningitis	Simple meningitis	Cerebrospinal meningitis: Total	Cerebrospinal meningitis: Meningococcus	Cerebrospinal meningitis: Not due to meningococcus	Year	Tuberculous meningitis	Simple meningitis	Cerebrospinal meningitis: Total	Cerebrospinal meningitis: Meningococcus	Cerebrospinal meningitis: Not due to meningococcus
	Death rate per 100,000						Death rate per 100,000				
1900	9.43	33.77	6.82	--------	--------	1922	4.35	2.67	1.86	0.94	0.92
1901	9.10	27.11	5.85	--------	--------	1923	4.07	2.69	2.05	1.05	1.00
1902	9.20	24.48	5.34	--------	--------	1924	3.96	2.53	1.71	.95	.76
1903	9.56	21.90	6.04	--------	--------	1925	3.60	2.57	1.74	1.05	.69
1904	9.79	21.45	12.66	--------	--------	1926	3.58	2.36	1.99	1.33	.66
1905	9.86	18.49	20.30	--------	--------	1927	3.23	2.21	2.14	1.56	.58
1906	9.85	15.94	8.48	--------	--------	1928	2.99	2.27	3.12	2.55	.57
1907	9.77	15.52	8.59	--------	--------	1929	2.66	2.37	5.17	4.48	.69
1908	9.39	12.90	4.68	--------	--------	1930	2.52	2.08	4.03	3.56	.47
1909	9.15	10.88	4.35	--------	--------	1931	2.26	1.95	2.73	2.37	.36
1910	8.82	9.88	4.16	0.35	3.81	1932	1.92	1.68	1.66	1.39	.27
1911	9.01	7.88	4.19	.79	3.40	1933	1.76	1.68	1.42	1.18	.24
1912	8.50	6.25	4.76	2.00	2.76	1934	1.67	1.66	1.22	1.01	.21
1913	8.74	5.83	4.36	1.58	2.78	1935	1.54	1.84	2.42	2.09	.33
1914	8.22	4.95	3.91	1.66	2.25	1936	1.44	1.98	2.68	2.36	.32
1915	8.09	4.24	3.24	1.42	1.82	1937	1.28	1.83	2.02	1.71	.31
1916	7.91	3.56	3.48	2.12	1.36	1938	1.28	1.78	.98	.79	.19
1917	8.00	3.57	5.09	3.53	1.56	1939	1.12	1.58	.72	.66	.06
1918	7.23	3.92	5.26	2.86	2.40	1940	.99	1.65	.59	.53	.06
1919	6.14	3.06	3.40	1.81	1.59	1941	1.01	1.60	.59	.54	.05
1920	5.60	3.01	2.98	1.62	1.36	1942	.91	1.64	.78	.73	.05
1921	4.79	3.00	2.52	1.44	1.08	1943	.87	1.89	2.24	2.18	.06

[1] Related titles for meningitis through all International List revisions:

International List title	Tabulated for the years— 1900–09	1910–20	1921–29	1930–38	1939–
	International List number				
Tuberculous meningitis	28	30	32	24	14
Simple meningitis	61 (pt. 1)	61 (1)	71 (a)	79 (a)	81 (a)
Cerebrospinal meningitis, total	61 (pt. 2)				
Meningococcus	------------	61 (3)	24	18	6
Not due to meningococcus	------------	61 (2)	71 (b)	79 (b)	81 (b)

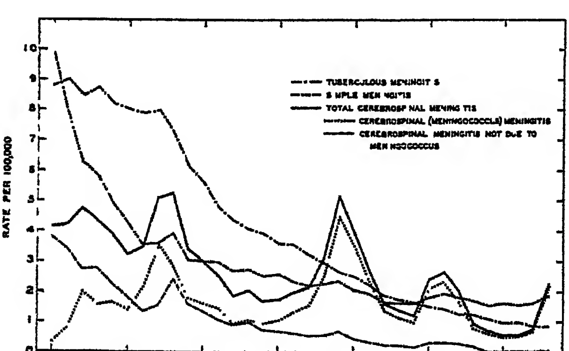

FIGURE 1.—The course of meningitis in the United States, for all subdivisions of the International List, 1910–43.

A tabulation change which affects urban and rural comparisons of mortality is allocation of deaths to place of residence. This has been done by the Bureau of the Census since 1938.

Recorded mortality from meningitis is shown for the Death Registration States in table 1 and figure 1. Tuberculous meningitis shows a continuous decline which is more rapid from 1917 on; a decline which could have been caused by any of a number of sanitary or health measures. Simple meningitis has also been declining since 1900; the decline was more rapid from 1900 to about 1915 than after that time. The decline in the total of cerebrospinal meningitis is accompanied by four distinct epidemic waves, 1910–42, not seen in tuberculous or simple meningitis (fig. 1). The broken and dotted lines of figure 1

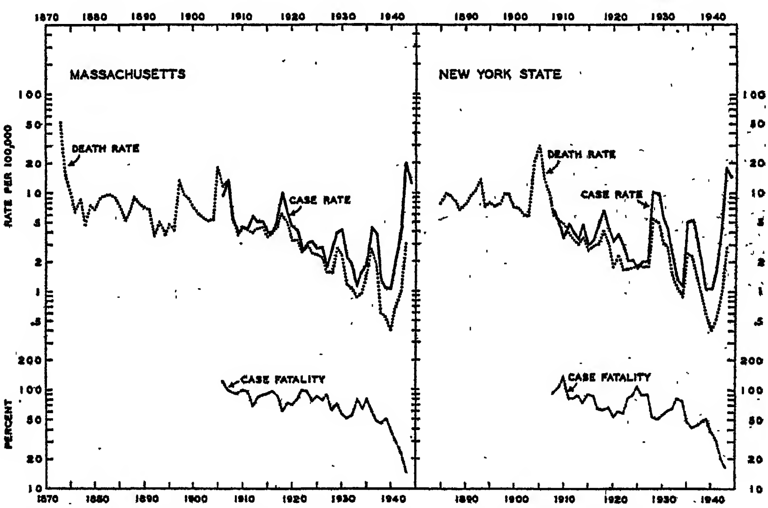

FIGURE 2.—The course of morbidity, mortality, and case fatality from cerebrospinal meningitis in Massachusetts, 1873–1944; and in New York State, 1880–1944. Deaths are for the total of cerebrospinal meningitis.

represent the subdivisions of cerebrospinal meningitis which the Bureau of the Census recommends be combined, 1910–38, for comparability with the classification group cerebrospinal (meningococcus) meningitis of the 1938 revision. It is clear from figure 1 that prior to approximately 1925 a transfer of deaths took place from the one classification title to the other, probably the result of a decreasingly smaller percentage of death certificates on which the cause of death was stated to be merely cerebrospinal meningitis unqualified. After approximately 1925 cerebrospinal meningitis not due to meningococcus is a relatively small percentage of the total rate.

Annual morbidity, mortality, and case fatality.—State records of deaths from cerebrospinal meningitis for Massachusetts (*9*) and New York (*10*) (fig. 2) show no particular trend prior to 1905. Several rela-

tively small epidemics occurred during the early years which did not synchronize in the two States except for the marked epidemic of 1905. Since 1905 there has been a decline in the death rate and case rate in both Massachusetts and New York. Although the decline in mortality, 1905 to 1940, is slightly more than in morbidity the difference is probably no greater than could be accounted for by an increase in reporting of cases. The decline in reported case fatality amounted to approximately 3 percent annually, or from about 80 percent in 1925 to 55 percent in 1935. Since 1940 and during the recent major epidemic, however, the drop in case fatality has been greatly acceler-

TABLE 2.—*Annual incidence of cerebrospinal meningitis as reported in the United States and in each of nine geographic sections*,[1] 1916–44

Year	All sections	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
	Case rate per 100,000									
1916	2.84	4.40	2.68	2.83	2.49	5.08	1.84	1.43	3.01	1.54
1917	7.23	9.05	7.48	7.61	12.60	8.85	2.52	2.88	2.04	3.38
1918	7.52	9.05	6.54	6.03	6.04	11.56	8.12	22.18	4.65	5.57
1919	3.40	4.94	3.65	2.38	2.62	4.42	3.17	4.30	2.46	2.69
1920	3.28	4.58	2.91	3.01	2.98	3.87	1.66	3.86	5.11	4.62
1921	2.77	4.08	2.88	2.64	2.85	2.14	1.04	2.12	2.19	3.26
1922	2.22	3.38	2.40	1.99	1.77	2.01	.82	1.71	3.34	2.42
1923	2.19	3.41	1.98	1.72	1.40	3.10	1.51	3.89	4.27	2.27
1924	1.89	2.87	2.36	1.82	1.40	1.99	1.19	1.31	1.37	2.04
1925	1.94	2.63	1.85	1.62	1.27	1.75	2.29	1.40	3.17	3.68
1926	2.14	2.42	1.55	1.60	1.36	1.62	1.46	1.45	5.42	7.58
1927	2.99	1.83	1.74	3.63	3.00	1.62	1.53	1.59	11.22	7.30
1928	5.33	2.56	6.74	4.97	5.57	1.50	1.92	2.49	26.64	6.21
1929	9.59	3.95	7.84	12.64	9.38	2.80	3.35	7.82	44.12	13.85
1930	7.24	3.81	5.25	8.89	7.60	3.80	14.60	4.89	19.88	6.16
1931	4.73	2.30	4.49	5.27	4.68	3.61	8.77	3.14	8.56	3.80
1932	2.68	1.80	2.44	3.69	2.40	2.35	2.82	1.49	3.70	2.42
1933	2.39	1.26	1.72	3.51	2.80	2.20	2.04	2.26	2.52	2.15
1934	1.94	1.41	1.33	2.48	2.37	2.02	1.80	1.70	3.66	1.61
1935	4.89	2.02	3.79	5.26	5.56	8.41	4.69	4.00	5.50	4.48
1936	5.48	4.07	4.38	4.41	4.06	12.50	6.00	5.57	7.73	4.29
1937	4.15	3.40	3.18	2.83	2.58	9.37	7.49	4.32	4.80	3.45
1938	2.19	1.42	1.80	1.86	1.70	3.78	5.15	2.28	3.92	1.62
1939	1.47	1.12	1.69	.90	1.02	2.05	2.44	1.52	2.67	1.19
1940	1.27	1.08	1.40	.84	1.03	1.74	2.11	1.29	1.74	1.04
1941	1.52	1.84	1.60	.88	.84	2.68	2.61	1.60	1.37	1.25
1942	2.97	5.74	3.90	1.05	1.16	5.21	2.60	1.85	2.18	4.03
1943	14.09	25.61	16.35	9.77	9.17	17.75	12.41	7.14	12.47	17.55
1944	12.64	13.78	14.11	12.92	10.65	11.88	14.51	7.14	7.32	14.24

[1] Rates are based on the following 40 States except for the omissions noted (records are continuous for the 40 States from 1926 on):

New England: Maine, Massachusetts, Rhode Island, and Connecticut. Maine omitted, 1916; Rhode Island omitted, 1925.
Middle Atlantic: New York, New Jersey, and Pennsylvania. New Jersey omitted, 1916, 1917; Pennsylvania omitted, 1924, 1925.
East North Central: Ohio, Indiana, Illinois, Michigan, and Wisconsin. Michigan omitted, 1916–23; Wisconsin omitted, 1919.
West North Central: Minnesota, Iowa, Missouri, North Dakota, Nebraska, and Kansas. Iowa omitted, 1916–23; Missouri omitted, 1916–23; North Dakota omitted, 1916–23; Nebraska omitted, 1916, 1917.
South Atlantic: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, and Florida. Delaware omitted, 1916–23; Virginia omitted, 1921, 1922; West Virginia omitted, 1916–23; North Carolina omitted 1916, 1917, and 1922; Florida omitted, 1916, 1917.
East South Central: Tennessee, Alabama, and Mississippi. Tennessee omitted, 1916–23; Mississippi omitted 1918.
West South Central: Arkansas, Louisiana, and Oklahoma. Arkansas omitted, 1916–23; Oklahoma omitted, 1916–24.
Mountain: Montana, Idaho, Wyoming, Colorado, Arizona, and Utah. Idaho omitted, 1916–25; Wyoming omitted, 1921; Colorado omitted, 1916–23; Arizona omitted, 1916–23; Utah omitted, 1916–24.
Pacific: Washington, Oregon, California; Washington omitted, 1920.

Because of the above selection of States the rates in this table may vary to a slight extent from similar rates published by Hedrich and others.

ated, namely, from approximately 40 percent in 1940 to 15 percent in 1943, or a decline of about 20 percent annually for the 3-year period.

In the country as a whole (tables 2 and 3) morbidity and mortality during the present epidemic were not as high relative to earlier epidemics as in Massachusetts and New York. The decline in case fatality, however, has been similar, that is, from about 4 percent annually or from an average of 85 percent in 1925 to 53 percent in 1935, to about 20 percent annually, or from 39 percent in 1940 to 17 percent in 1943 (table 4). The case fatality among cases treated

TABLE 3.—*Annual mortality from cerebrospinal meningitis*[1] *in the United States and in each of nine geographic sections,*[2] *1916–44*

Year	All sections	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
	Death rate per 100,000									
1916	3.19	4.24	2.83	3.12	3.04	3.96	---------	---------	4.93	2.77
1917	4.19	6.23	5.25	5.56	6.68	5.21	---------	---------	4.36	2.51
1918	4.96	5.99	5.04	4.15	3.98	6.81	---------	5.85	7.09	3.94
1919	3.18	4.28	3.22	2.79	2.54	3.72	1.62	2.51	4.07	3.15
1920	2.85	3.63	2.66	2.45	2.54	3.30	1.94	3.58	4.01	3.77
1921	2.34	2.83	2.44	2.13	2.20	2.69	2.03	.81	2.01	2.47
1922	1.76	1.86	2.19	1.51	1.19	1.71	.92	.96	2.27	1.82
1923	1.99	2.60	1.99	1.83	1.40	2.26	1.13	1.89	3.07	2.15
1924	1.73	2.05	1.93	1.52	1.31	2.13	1.89	1.50	2.25	1.79
1925	1.72	1.81	1.81	1.49	1.42	1.98	1.54	.97	1.71	2.82
1926	1.98	1.88	1.70	1.63	1.36	2.35	1.75	1.51	3.31	5.95
1927	2.14	1.57	1.58	2.24	1.81	1.94	1.60	1.40	6.46	4.14
1928	3.26	1.76	4.00	3.20	2.92	1.55	1.71	1.96	13.89	3.50
1929	5.30	2.48	4.27	6.73	5.09	2.41	2.68	4.42	23.15	7.11
1930	3.99	1.78	2.88	4.49	4.43	2.55	7.59	3.66	12.07	3.23
1931	2.71	1.18	2.54	2.99	2.43	2.43	4.15	2.17	5.93	2.45
1932	1.65	1.14	1.56	2.05	1.41	1.58	1.55	1.45	2.85	1.40
1933	1.44	.74	1.13	1.63	1.68	1.55	1.33	1.89	2.55	1.24
1934	1.20	.73	.97	1.31	1.55	1.50	1.12	1.23	1.92	.87
1935	2.45	1.40	1.98	2.58	2.51	3.98	2.40	2.42	2.68	2.19
1936	2.56	2.25	2.06	2.18	2.03	5.20	2.54	2.80	3.90	1.95
1937	2.00	1.75	1.58	1.50	1.51	4.07	3.18	2.07	2.34	1.61
1938	.94	.54	.90	.63	.71	1.50	2.00	.99	1.39	.72
1939	.60	.45	.64	.32	.45	.98	1.08	.54	1.32	.50
1940	.50	.46	.55	.31	.40	.81	.68	.54	.82	.31
1941	.53	.63	.51	.24	.41	.96	1.13	.50	.63	.32
1942	.75	1.01	.90	.35	.38	1.45	.68	.53	.95	.87
1943	2.26	3.46	2.83	1.89	1.48	2.71	1.76	1.03	2.01	2.40
1944	2.19	2.28	2.47	2.36	1.78	2.15	2.49	1.27	2.11	1.92

[1] The following International List Titles were used: 61 (2) and (3), 1916–20; 24 and 71 (b), 1921–29; 18 and 79 (b), 1930–38; 6, 1939–43. Deaths for 1942 and 1943 are resident. Deaths for 1944 are from Notifiable Diseases (*15*).

[2] Rates are based on the following 40 States except for the omissions noted (records are continuous for the 40 States from 1928 on):

New England: Maine, Massachusetts, Rhode Island, and Connecticut. Maine omitted, 1916; Rhode Island omitted, 1925.

Middle Atlantic: New York, New Jersey, and Pennsylvania. New Jersey omitted, 1916, 1917; Pennsylvania omitted, 1924, 1925.

East North Central: Ohio, Indiana, Illinois, Michigan, and Wisconsin. Illinois omitted, 1916, 1917; Michigan omitted, 1916–23; Wisconsin omitted, 1919.

West North Central: Minnesota, Iowa, Missouri, North Dakota, Nebraska, and Kansas. Iowa omitted, 1916–23; Missouri omitted, 1916–23; North Dakota omitted, 1916–23; Nebraska omitted, 1916–19.

South Atlantic: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, and Florida. Delaware omitted, 1916–23; Virginia omitted, 1921, 1922; West Virginia omitted 1916–24 North Carolina omitted, 1916, 1917; Florida omitted, 1916–18.

East South Central: Tennessee, Alabama, and Mississippi. Tennessee omitted, 1916–23; Alabama omitted, 1916–24; Mississippi omitted, 1916–18.

West South Central: Arkansas, Louisiana, and Oklahoma. Arkansas omitted, 1916–26; Louisiana omitted, 1916, 1917; Oklahoma omitted, 1916–27.

Mountain: Montana, Idaho, Wyoming, Colorado, Arizona, and Utah. Idaho omitted, 1916–25; Wyoming omitted, 1916–21; Colorado omitted, 1916–23; Arizona omitted, 1916–25; Utah omitted, 1916–24.

Pacific: Washington, Oregon, California. Washington omitted, 1920; Oregon omitted, 1916, 1917.

Because of the above selection of States the rates in this table may vary to a slight extent from similar rates published by Hedrich and others.

at Gallinger Municipal Hospital, Washington, D. C., (*7*) during the spring of 1943 is reported as 10.2 percent.

During the First World War fatality from cerebrospinal meningitis in the United States Army is reported to have been 39 percent with 5,839 cases and 2,279 deaths occurring in 33 months from April 1917 to December 1919 (*12*); during the present epidemic case fatality has been cut, by the use of sulfa compounds, to as low as 3.3 percent among cases occurring in the Fourth Service Command during the first 6 months of 1943 (*11*).

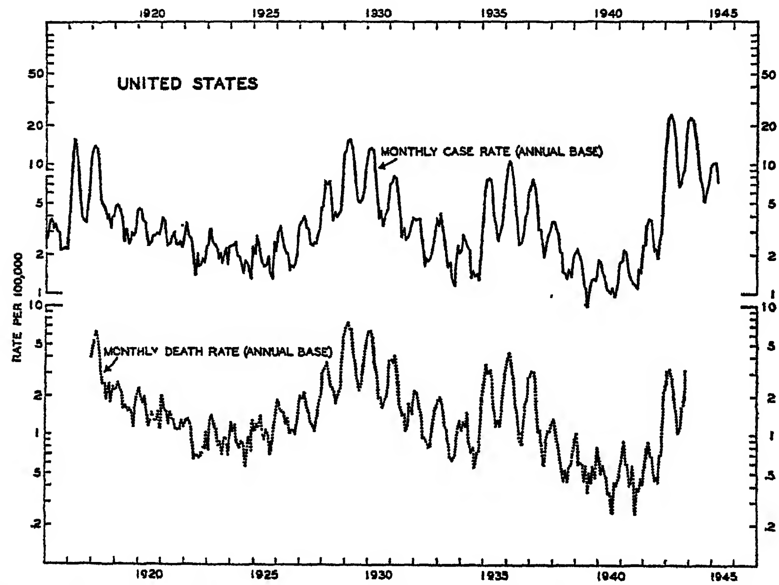

FIGURE 3.—Monthly morbidity and mortality (annual base) from cerebrospinal meningitis in the United States, 1916–44. Deaths are for cerebrospinal (meningococcus) meningitis.

The records of cases and deaths in Massachusetts and New York indicate a direct relationship between the percentage of cases reported and the presence of an epidemic. In New York State, for example, 1925–26 and 1933–34 were interepidemic while 1928–29 and 1935–36 were epidemic years. During these epidemic years recorded case fatality was roughly 50 percent, whereas, during interepidemic years it rose to 80 percent or more; this probably indicates a substantial increase in the number of minor cases reported during epidemics which escape detection in interepidemic years.

Cerebrospinal meningitis in the United States.—Figure 3 shows the monthly incidence and mortality from cerebrospinal meningitis as reported in the United States. Rates are based on the records of 40 States which supplied continuous reports of cases from 1926 on; from 1916 to 1925 the records of cases are less complete and the rates are based on an expanding area (see table 2, footnote 1). Monthly

deaths are for cerebrospinal (meningococcus) meningitis and do not include cerebrospinal meningitis not due to meningococcus.

The course of meningitis is a series of epidemic waves extending over varying numbers of years. The rates rise from a relatively low level to epidemic proportions and fall again to an insignificant amount. The word "epidemic" may perhaps be used to describe these periods of high incidence even though in the case of meningitis an "epidemic" is of several years' duration. Since 1916 there have been four distinct epidemic waves of meningitis in the United States. The first (fig. 3) began prior to 1916, reached a maximum in 1917, and descended slowly through 1924; the second period was of 10 years' duration, 1925 to 1934, with the peak in 1929; the third cycle extended from 1935 to 1940 with 1936 as the peak year; the current epidemic reached its peak in 1943 and is subsiding at the present time.

TABLE 4.—*Annual deaths per reported cases of cerebrospinal meningitis*[1] *in the United States,*[2] *1916–44*

Year	Case fatality	Year	Case fatality	Year	Case fatality	Year	Case fatality	Year	Case fatality	Year	Case fatality
	Percent		*Percent*		*Percent*		*Percent*		*Percent*		*Percent*
1916..	106.9	1921..	82.8	1926..	90.9	1931..	57.3	1936..	46.7	1941..	34.4
1917..	67.1	1922..	77.9	1927..	71.0	1932..	61.4	1937..	48.1	1942..	25.8
1918..	65.2	1923..	91.2	1928..	61.1	1933..	60.2	1938..	43.0	1943..	16.0
1919..	92.8	1924..	89.2	1929..	55.3	1934..	61.8	1939..	41.1	1944..	17.3
1920..	85.3	1925..	87.8	1930..	55.1	1935..	50.0	1940..	39.2		

[1] See table 3, note 1, for International List titles used for deaths from cerebrospinal meningitis.
[2] See table 3, note 2, for the States included.

A seasonal cycle in meningitis is superimposed upon the longer cyclical movement. The seasonal peak usually occurs in March although it is frequently in February or April; in half of the 29 years (1916–44) March was the peak month, in the remainder of the time the peak occurred in February or April. From July to November meningitis rates are comparatively low. A calendar year includes by far the major portion of an individual seasonal cycle, although October to September would be a somewhat better annual period for meningitis. The rate of increase in the rates from the low period in August, September, and October to the peak in February, March, and April is somewhat greater at the crest than at the trough of an epidemic cycle. The epidemic and seasonal cycles are evident in both cases and deaths from cerebrospinal meningitis.

Regional differences in the United States.—Quarterly case rates and annual case and death rates (fig. 4) show the course of cerebrospinal meningitis in nine geographic regions of the United States. The four epidemic periods seen in the country as a whole are also evident in each of the sections. Neither the peak nor the low years are identical in all sections and the relative importance of a specific epidemic varies with section; nevertheless, the general appearance of the curves is the

Table 5.—*Monthly incidence of cerebrospinal meningitis as reported in the United States,[1] 1916–45 (September)*

Year	January	February	March	April	May	June	July	August	September	October	November	December
	Case rate per 100,000 (annual base)											
1916	2.65	2.74	3.45	3.75	3.16	3.37	3.06	2.93	2.18	2.20	2.28	2.22
1917	3.15	5.64	11.41	15.69	13.62	10.05	5.83	3.88	3.07	3.53	4.28	5.91
1918	11.19	12.94	13.65	13.08	10.22	5.30	4.84	4.47	3.77	4.09	3.15	3.85
1919	3.96	4.63	4.81	4.43	3.52	2.52	3.07	2.46	2.50	2.90	2.80	2.95
1920	4.31	4.33	4.37	3.62	3.51	2.76	2.36	2.52	2.78	2.81	2.92	2.81
1921	3.13	3.80	3.68	2.84	2.34	2.42	2.67	2.93	2.42	2.37	2.47	2.26
1922	2.60	3.37	3.02	2.74	2.62	1.91	1.38	2.03	1.61	1.64	1.86	1.73
1923	2.25	2.39	3.10	2.56	2.39	2.17	1.82	2.02	1.69	2.06	2.20	1.65
1924	2.25	2.31	2.35	2.47	1.93	1.91	1.64	1.47	1.75	1.70	1.61	1.28
1925	2.28	2.02	2.72	2.32	1.95	1.70	1.58	1.63	1.90	1.45	1.27	2.44
1926	2.12	2.93	3.23	2.72	2.30	2.03	1.97	1.52	1.63	1.57	1.67	2.02
1927	3.31	3.45	3.66	3.88	3.14	3.10	2.40	2.33	2.39	2.40	2.77	3.13
1928	4.53	4.73	7.38	6.57	7.31	5.41	3.58	4.25	3.88	4.04	4.36	7.40
1929	11.60	12.80	15.22	17.26	13.68	9.59	6.61	5.23	4.99	5.27	6.25	8.68
1930	11.32	12.91	13.27	12.98	7.57	4.97	3.80	4.41	3.31	3.64	4.20	4.59
1931	6.94	7.23	8.13	7.72	5.59	3.86	2.70	3.17	2.62	2.78	2.89	3.39
1932	3.78	3.68	3.70	3.73	2.72	2.30	1.65	1.86	1.75	1.88	2.25	2.83
1933	3.80	3.29	4.15	3.28	2.60	1.78	1.57	1.73	1.29	1.15	1.76	2.30
1934	2.06	2.41	2.77	2.56	2.30	2.12	1.31	1.48	1.36	1.39	1.26	2.30
1935	3.49	6.38	7.38	7.60	7.50	5.72	3.70	3.29	2.56	3.03	3.51	4.68
1936	7.05	8.96	10.43	9.41	6.86	4.26	3.14	2.42	2.44	2.78	3.81	4.21
1937	5.96	6.58	7.45	6.54	4.73	3.13	3.10	2.40	1.92	2.43	2.72	3.04
1938	3.58	3.51	3.22	2.91	2.12	2.00	1.46	1.42	1.32	1.52	1.34	1.89
1939	2.08	2.18	2.03	1.83	1.54	1.20	1.10	.80	1.09	1.26	1.27	1.24
1940	1.40	1.80	1.75	1.43	1.22	1.07	1.04	1.01	1.10	.94	1.08	1.26
1941	1.70	1.76	2.12	2.08	1.67	1.40	1.26	1.16	1.13	1.07	1.53	1.43
1942	2.29	2.40	3.26	3.70	3.64	3.14	2.16	2.21	1.86	2.57	2.83	5.47
1943	12.61	17.24	22.46	24.00	21.05	15.15	9.80	6.81	7.15	8.60	9.11	15.40
1944	22.13	23.09	21.90	19.52	15.09	9.93	7.80	6.49	5.23	6.22	7.01	7.94
1945	9.50	10.25	10.23	7.45	6.92	5.94	4.76	3.41	3.58	-------	-------	-------

[1] See table 2 note 1 for the States included.

Table 6.—*Monthly mortality from cerebrospinal (meningococcus) meningitis[1] in the United States,[2] 1918–44*

Year	January	February	March	April	May	June	July	August	September	October	November	December
	Death rate per 100,000 (annual base)											
1918	4.16	5.23	6.38	5.96	4.48	3.09	2.53	2.50	1.96	2.53	1.86	2.38
1919	2.25	2.31	2.56	2.28	2.12	1.06	1.72	1.54	1.59	1.50	1.18	1.72
1920	2.10	2.33	2.05	1.77	1.98	1.48	1.19	1.35	1.47	1.32	1.33	1.53
1921	1.14	1.60	1.65	1.52	1.25	1.50	1.34	1.32	1.14	1.12	1.12	1.27
1922	1.17	1.28	1.33	1.23	1.14	.66	.70	.70	.68	.69	.80	.79
1923	1.06	.78	1.29	1.42	1.23	1.11	.85	.69	.72	.94	.94	.71
1924	.87	1.25	1.07	1.21	.91	.80	.85	.88	.59	.77	.95	.76
1925	1.28	1.07	1.23	1.12	1.40	1.05	.95	1.08	1.01	.74	.89	1.20
1926	1.49	1.84	1.59	1.53	1.51	1.24	1.34	1.04	1.10	1.09	1.06	1.27
1927	1.39	2.04	1.98	2.16	1.81	1.52	1.27	1.19	1.10	1.22	1.30	1.67
1928	2.06	2.98	3.27	3.71	3.24	2.44	2.30	2.19	1.80	2.16	2.25	3.88
1929	5.44	6.78	7.56	6.70	6.64	4.19	3.50	2.70	2.24	2.53	3.22	4.49
1930	5.31	6.35	6.37	5.53	3.80	3.03	2.01	2.01	1.67	1.91	2.03	2.46
1931	3.80	3.55	3.71	4.08	2.93	1.77	1.45	1.46	1.10	1.20	1.77	1.52
1932	1.88	2.20	2.11	1.82	1.53	.97	.96	.91	.82	.84	1.11	1.56
1933	1.69	1.91	2.00	1.75	1.22	1.12	.88	.69	.66	.70	.91	1.21
1934	1.27	1.10	1.28	1.17	1.51	.86	.76	.61	.58	.73	.78	1.17
1935	2.03	2.36	3.57	3.13	3.22	2.18	1.55	1.19	1.38	1.23	1.58	2.26
1936	3.00	3.01	4.30	3.68	2.87	1.77	1.43	.98	.88	1.19	1.75	1.95
1937	2.83	2.95	3.17	3.13	1.83	1.08	1.11	.79	.61	.95	1.07	1.08
1938	1.26	1.34	1.10	.91	.70	.61	.46	.54	.45	.58	.61	.74
1939	.95	1.05	.61	.63	.60	.45	.50	.38	.52	.44	.58	.48
1940	.80	.74	.52	.58	.53	.46	.36	.37	.26	.43	.42	.49
1941	.59	.71	.90	.62	.61	.42	.44	.58	.25	.39	.38	.47
1942	.49	.65	.92	1.00	.79	.77	.48	.52	.48	.80	.86	1.29
1943	2.21	2.61	3.36	3.39	2.85	1.98	1.66	1.19	1.10	1.84	1.75	3.18
1944	4.25	3.54	3.43	3.16	2.38	1.80	1.23	1.02	.91	1.21	1.75	1.71

[1] See table 1, note 1, for International List titles.
[2] See table 2, note 1, for the States included.

same in all regions. In separate States, also, the incidence is generally similar to that for all areas. During the epidemic which reached its peak in 1929 for all States combined, the peak occurred in 1928 for 5 States, in 1929 for 24 States, in 1930 for 9 States, and in 1931 for 2 States. During the 1936 epidemic, 12 States had a peak rate in 1935, 22 in 1936, and 6 in 1937. Low rates extend over a longer period in single States than in the entire country but the trough tends to occur at approximately the same time in every State.

In each epidemic of meningitis for which there is a record, all sections of the country were affected. The epidemic of 1917 appeared early in the Eastern States; the peak occurred in 1917 in the New England, Middle Atlantic, and North Central sections, and in 1918 in the remainder of the Southern and Western sections. In the Mountain and Pacific regions the epidemic of 1917 occurred late and was relatively less important there than in the rest of the country. Following the 1917 epidemic the South Central sections reached a low incidence of meningitis at about 1921 or 1922, and the Pacific in 1924; while the rate in the Central, Eastern, and Southern sections continued to decline until 1925 or later. The epidemic of 1929 was of major importance in all sections except the South Atlantic. The epidemic appeared first in the Pacific and Mountain sections but reached its peak (deaths) in 1929 in all sections except the South Atlantic and East South Central where the maximum rate occurred in 1930. The year 1934 was a low year for the incidence of meningitis in all sections. The epidemic of 1936 was of less importance than that of 1929 in all sections except the South Atlantic and possibly New England. The South Atlantic section experienced a relatively severe epidemic in 1936. The peak occurred in 1935 in the North Central and Pacific sections and in 1937 in the East South Central; in all other regions the maximum rate (deaths) occurred in 1936. Low rates of meningitis occurred in 1940 and 1941 in all sections. The current epidemic has been severe in all regions, particularly in the New England and Middle Atlantic, where the rates have been greatly in excess of those recorded during any other epidemic. In the remainder of the sections the current epidemic is approximately of the magnitude of that of 1929 with the exception of the South Atlantic where it was somewhat greater than the epidemic of 1936. The 1943 epidemic started earlier and reached a peak earlier (1943) in the coast sections, namely, in the New England, Middle Atlantic, South Atlantic, and Pacific and Mountain areas. In the North Central and South Central regions the maximum rate occurred in 1944. Indications are that the peak of the present epidemic has been passed in all regions.[3]

[3] Reported cases of cerebrospinal meningitis for October and November of the year 1945 have been received since this article was submitted. For the entire country they show a seasonal increase in the disease which is on a general level somewhat above the 5-year median but well below the level of last year. The incidence in each section also, during October and November 1945, is consistently lower than last year.

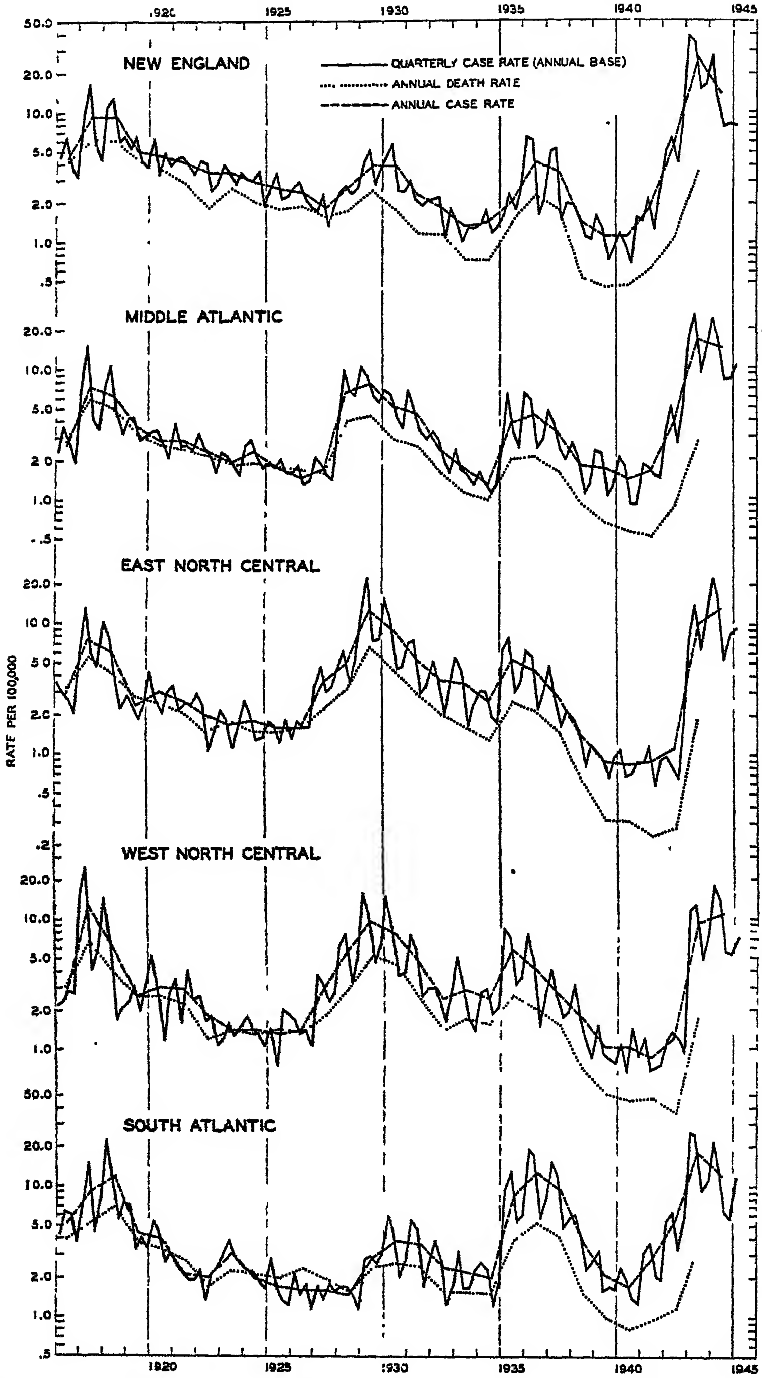

FIGURE 4a.—Quarterly morbidity (annual base) and annual morbidity and mortality from cerebrospinal meningitis in nine geographic sections of the United States, 1916-44. Deaths are for the total of cerebrospinal meningitis.

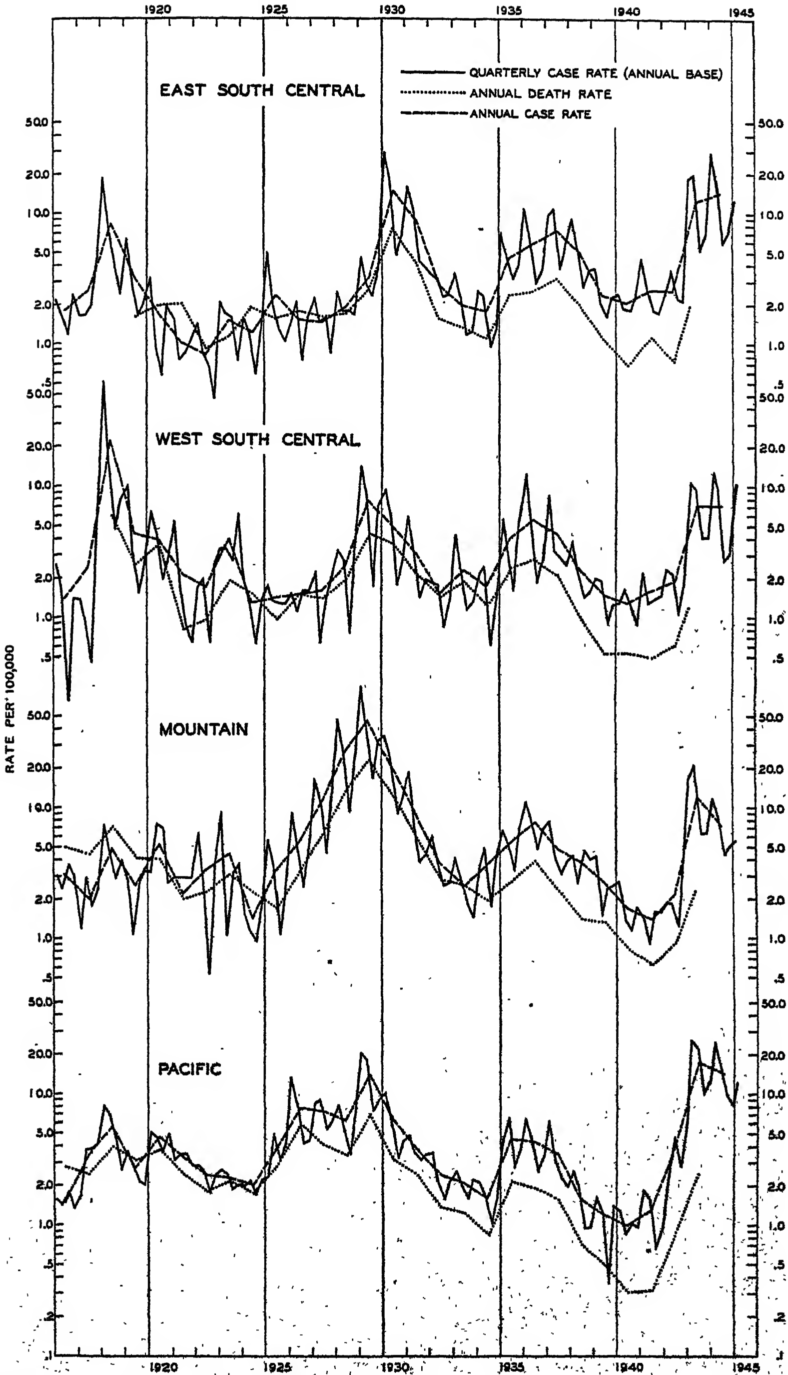

FIGURE 4b.—Quarterly morbidity (annual base) and annual morbidity and mortality from cerebrospinal meningitis in nine geographic sections of the United States, 1916–44. Deaths are for the total of cerebrospinal meningitis.

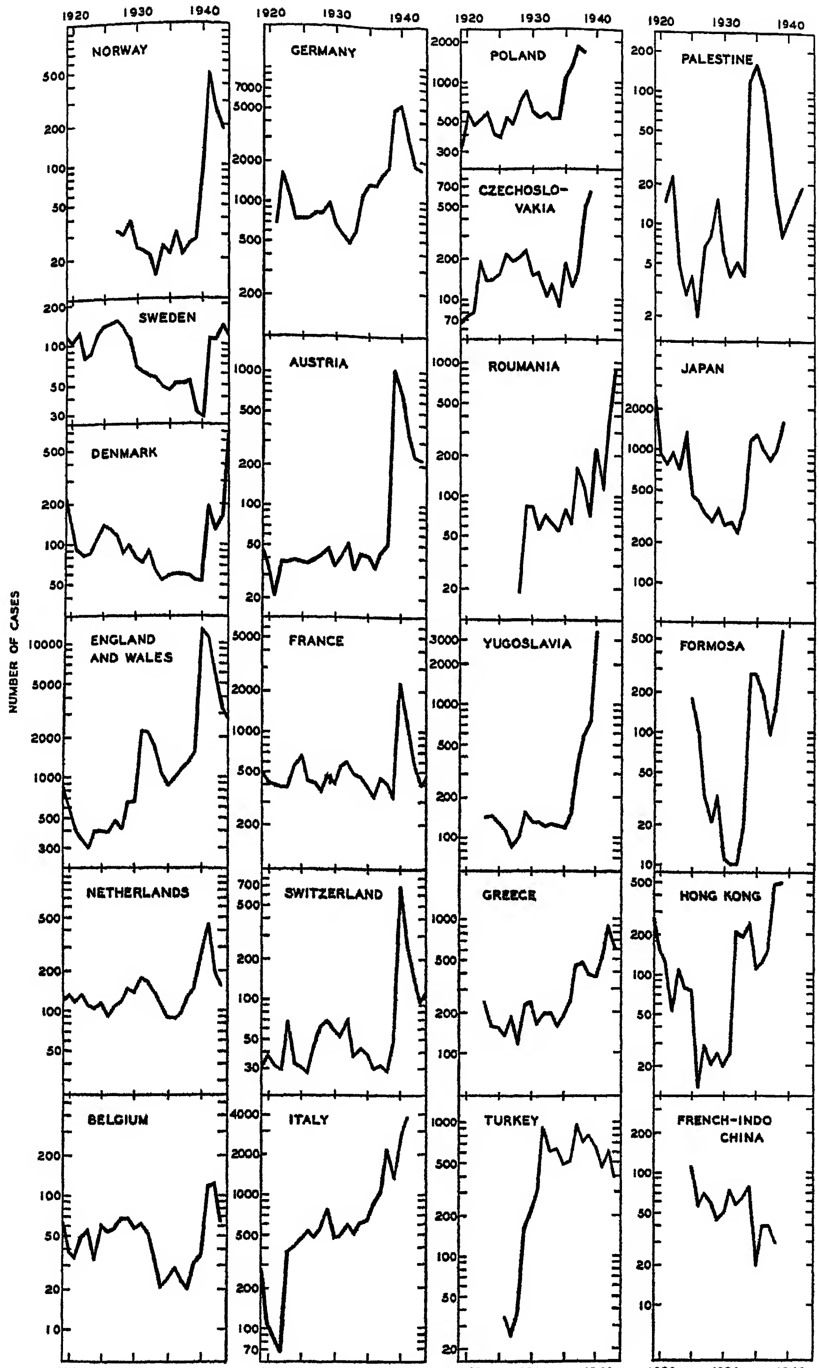

FIGURE 5a.—Number of reported cases of cerebrospinal meningitis in foreign countries, 1919–44. Current reports of cases of communicable diseases to the Health Section of the League of Nations.

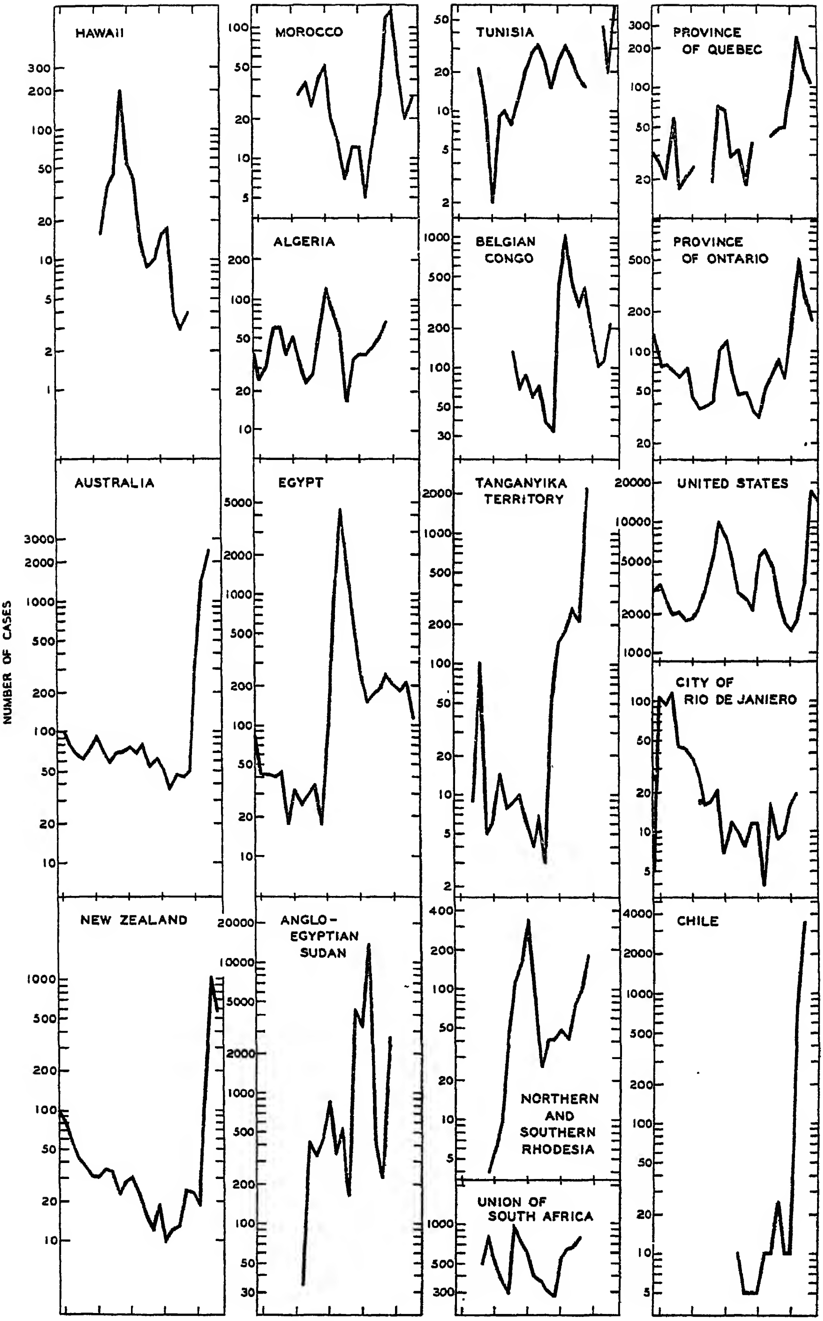

FIGURE 5b.—Number of reported cases of cerebrospinal meningitis in foreign countries, 1919–44. Current reports of cases of communicable diseases to the Health Section of the League of Nations.

Cerebrospinal meningitis in foreign countries.—Figure 5 shows the incidence of cerebrospinal meningitis during a number of years for a large proportion of the countries which furnished the Health Section of the League of Nations (*6*) with a report of current cases. The graphs are of numbers of cases plotted on semilogarithmic paper. Rates for foreign countries have not been computed since the level of reported cases could not be compared for various countries, in any case; and both numbers of cases and case rates would give identical lines plotted on a logarithmic scale, except for possible changes in population over a period of years.

The earliest records are for 1919 and so do not include the period of the first World War. In special articles which have appeared from time to time in the monthly Epidemiological Report of the Health Section of the League of Nations the statement is made that there was "universal increase in cerebrospinal meningitis during the war years and immediately after." The very marked increase associated with the second World War is obvious from the chart; maximum rates occurred in the various countries from 1939 to 1943 or the year of the last report. Following the First World War the incidence of cerebrospinal meningitis declined in foreign countries and remained relatively constant for several years as it did in the United States. During the remainder of the period between the two World Wars there have occurred one, two, or possibly three periods of increased incidence which more or less synchronize over large areas. Inspection of the chart will give the available details for specific countries. On the whole, however, the first epidemic increase to follow World War I was in the United States and Canada, in 1929. Countries of Eastern Europe, for example Poland, also showed increases at about that time. Western Europe, however, experienced increases somewhat later, approximately 1931; Northern Africa in 1930; Egypt in 1932. The 1936 epidemic in the United States has no counterpart in Europe; in the relatively few countries which represent Asia and in Southern Africa, however, there were periods of increased incidence centering about 1935. Australia and New Zealand were relatively free from cerebrospinal meningitis from 1919 to 1940.

It is noteworthy that in African countries a period of exceptionally high incidence of meningitis is followed by a rate which is practically zero. Although cases are better reported during epidemics than during the periods between them the differences in the numbers of cases in epidemic and nonepidemic periods are so great that this fact would seem to be only a partial explanation of the difference.

SUMMARY

Cerebrospinal meningitis became increasingly prevalent in the United States at the end of 1942 after the United States entered the second World War. The number of reported cases in 1943 and 1944 is the largest ever recorded for the entire country.

State reports of cerebrospinal meningitis for Massachusetts and New York (1873–1942) show a series of epidemic waves which have had a downward trend since about 1905 in both cases and deaths. Case fatality shows a marked decrease since 1940. In the country as a whole the case fatality of cerebrospinal meningitis, based on reported cases, has declined from 55 percent in 1930 to 39 percent in 1940, and 16 percent in 1943; a case fatality of 3 percent in 1943 is reported for some Army camps.

A continuous record of reported cases is available for a majority of the States (40 States from 1926 on); and shows four distinct epidemic periods since 1916, each wave extending over a series of years. All sections of the country contributed to each epidemic rise although the peak year, the length of the epidemic period, and the severity of the epidemic vary in the several sections.

Reports of foreign countries to the Health Section of the League of Nations show a very marked rise in the incidence of meningitis at the beginning of World War II in practically every country where records are available. Between 1919 and the opening of World War II most of the countries of the world experienced one, two, or possibly three minor epidemic waves which tended to synchronize over large areas.

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SOME PHYSICAL PROPERTIES OF DDT AND CERTAIN DERIVATIVES [1]

By Howard L. Andrews, *Senior Physicist,* William C. White, *Associate Physicist,* Loubov R. Gamow, *Junior Physicist,* and Dorothy C. Peterson, *Junior Chemist, United States Public Health Service*

In a previous report the ultraviolet absorption spectrum and the X-ray diffraction pattern (*1*) of DDT were described and applied to the detection of low concentrations in air and in biological materials. Since the publication of that information certain derivatives have proved to be of particular interest in studies of the mode of action and the fate of ingested DDT. The present report extends the ultraviolet absorption studies to four DDT derivatives, and includes the infrared absorption spectra and the X-ray diffraction patterns of the five compounds. A crystallographic analysis of DDT is also presented.

In the previous work the DDT used was supplied by Dr. H. L. Haller, Bureau of Entomology and Plant Quarantine, Department of Agriculture. In the present study the DDT was recrystallized, melting point 108.6° to 109.5° C, supplied by the Insect Control Board of the Office of Scientific Research and Development as Standard DDT. The four derivatives were synthesized (*2*) in this laboratory by T. R. Sweeney and W. C. White:

1. 2,2 bis(p-chlorophenyl)1,1 dichloroethylene (dichlordiphenyl-dichlorethylene), melting point 89° C.
2. Di(p-chlorophenyl)acetic acid (dichlordiphenyl acetic acid), melting point 166.0° to 166.5° C.
3. 4,4′ dichlorodiphenylmethane (dichlordiphenyl methane) melting point 55° C.
4. p,p′ dichlorobenzophenone (dichlordiphenyl ketone) melting point 147° to 148° C.

[1] From the Industrial Hygiene Research Laboratory, National Institute of Health.

In the previous work on DDT an ether-alcohol mixture was used as a solvent and determinations were made with a Hilger Spekker spectrophotometer and a Beckman spectrophotometer. In the present work the Beckman spectrophotometer was used exclusively with 2, 2, 4 trimethyl pentane (isooctane) as the solvent.

The data obtained are presented in figure 1. DDT is characterized by one main band with its peak at 237.5 mμ. There is evidence of a weaker band at 221 mμ and several much weaker bands between 260 and 280 mμ. Using the main band at 237.5 it appears that in the absence of interfering substances 0.5 microgram can be detected and 3.0 micrograms accurately measured.

Dichlordiphenyl dichlorethylene shows a rather general absorption throughout the ultraviolet. There is a suggestion of an absorption maximum at 242 mμ which may be the 237.5 band of DDT displaced. There is no evidence of the structure found in DDT between 260 and 280 mμ.

Dichlordiphenyl acetic acid shows an absorption band with a maximum at 229.5 mμ which is probably the 237.5 DDT peak displaced. The molecular extinction is slightly greater in DDT but the difference is not large. The four low intensity bands found in DDT between 260 and 280 mμ are also present in the acetic acid derivative but occur at slightly different wave lengths. The acetic acid compound shows no sign of the 221-mμ peak found in DDT, but it is possible that this has been shifted to a wave length below the range of the instrument.

A prominent peak is also found in dichlordiphenyl methane but is shifted to 228.5 mμ. In the DDT absorption curve there is evidence of several bands in this region which are only partially resolved. In the methane compounds there is evidence of still more unresolved bands below 228 mμ. Here again the 221-mμ band is missing but has probably been displaced to a shorter wave length. In the methane compound the structure in the longer wave length region is more prominent and two additional bands can be seen.

Dichlordiphenyl ketone shows an absorption distinctly different from DDT. There is one very broad band with a peak at 261 mμ with no evidence of any partially resolved bands. As might be expected there is no resemblance to the absorption curves for diphenyl and diphenyl methane.

As can be seen from figure 1 the maximum values of molecular extinction fall within a narrow range and hence the lower limits of detection will be nearly the same for each of the pure compounds. For some combinations, notably the ketone and DDT, the components of a mixture can be determined, but for other combinations separation is

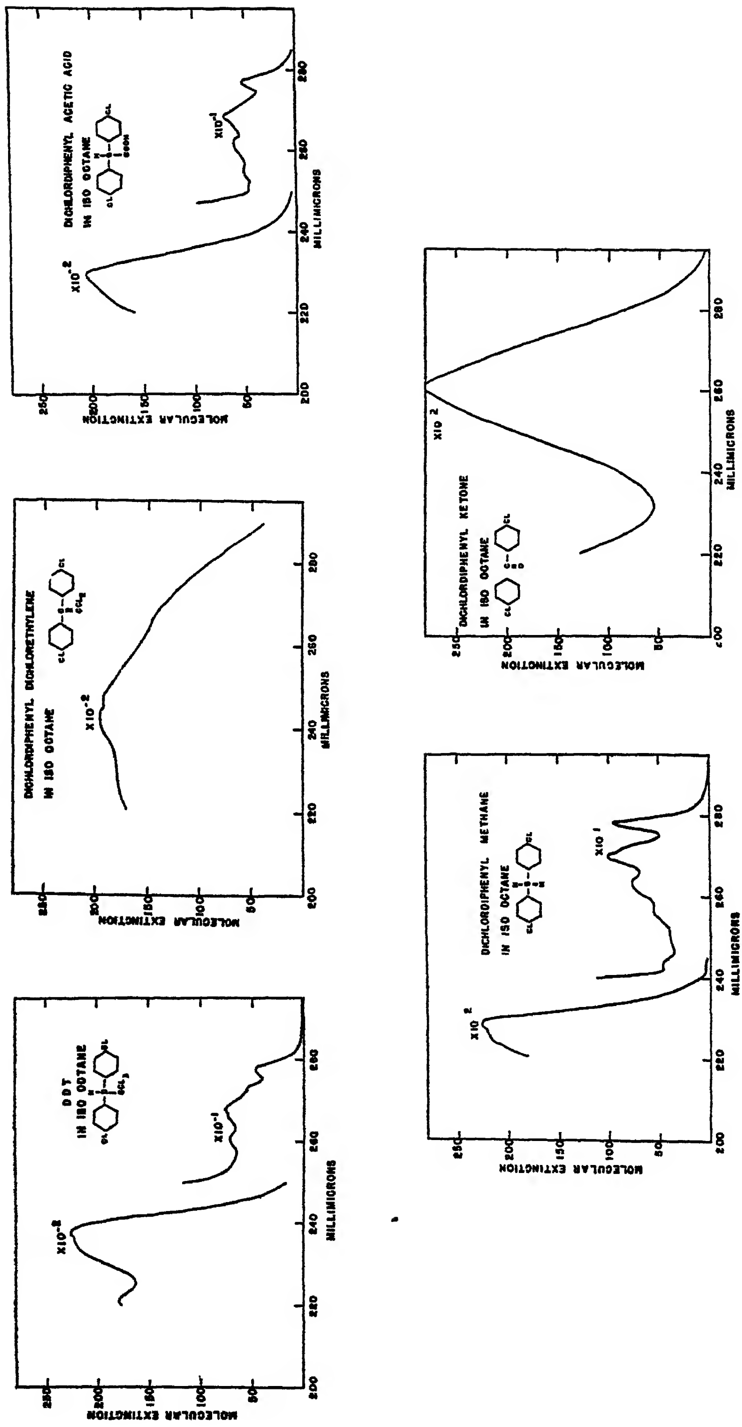

FIGURE 1.—Ultraviolet absorption spectra of DDT and four related compounds.

impossible. The striking differences between the ethylene and ketone curves and those for the other compounds emphasize the profound effect of double bonds on ultraviolet absorption spectra.

INFRARED ABSORPTION SPECTROSCOPY

All of the infrared spectra reported here were taken on a Perkin-Elmer Model 12A infrared spectrometer with a double passage of light through a 60° sodium chloride prism. All measurements covered the wave-length range from 1 to 13 microns. The slit widths were kept as narrow as was consistent with adequate galvanometer deflections. A series of 10 slit widths was used to cover the entire wave-length range and always had the same value at any given wave length. Some data in the 1–4-micron region has been obtained with a double prism spectrometer with lithium fluoride optics but is not presented here since the increased dispersion makes comparisons with other data difficult, and only a small portion of the spectrum can be studied.

Attempts were made to obtain crystalline layers with sufficiently high optical quality to permit direct absorption measurements. In no case could such a film be obtained, the crystals always forming in random orientations so that light scattering was severe. It was therefore necessary to study the absorption in suitable solvents. Carbon tetrachloride was used from 1 to 8 microns but is not satisfactory at longer wave lengths because of its own intense absorption bands. Carbon disulphide was used from 7 to 13 microns. These solvents are not ideal but appear to be the best available.

The absorption curves are shown in figure 2. The spectra are quite complex and only a few correlations can be made between them and the chemical structures.

All the compounds show a band at approximately 3.2 microns (3,100 cm.$^{-1}$), which is characteristic of aromatic C-H band stretching. In DDT, dichlordiphenyl methane, and dichlordiphenyl acetic acid there is evidence of a second band at about 2,950 cm.$^{-1}$ which is associated with an aliphatic C-H band stretching, and these three compounds all have a C-H band outside a ring.

Dichlordiphenyl acetic acid and dichlordiphenyl ketone show prominent sharp bands at 1,750 cm.$^{-1}$ and 1,700 cm.$^{-1}$, respectively. These bands fall within the range commonly associated with the C-O linkage and these two compounds are the only ones in this series having this group.

All five compounds show a band at about 1,500 cm.$^{-1}$ which is probably the second harmonic of the C-Cl vibration which usually occurs at 750 cm.$^{-1}$. The fundamental frequency of this band lies beyond the long wave-length limit of the present data.

All five compounds show a strong band near 9.2 microns, and this is

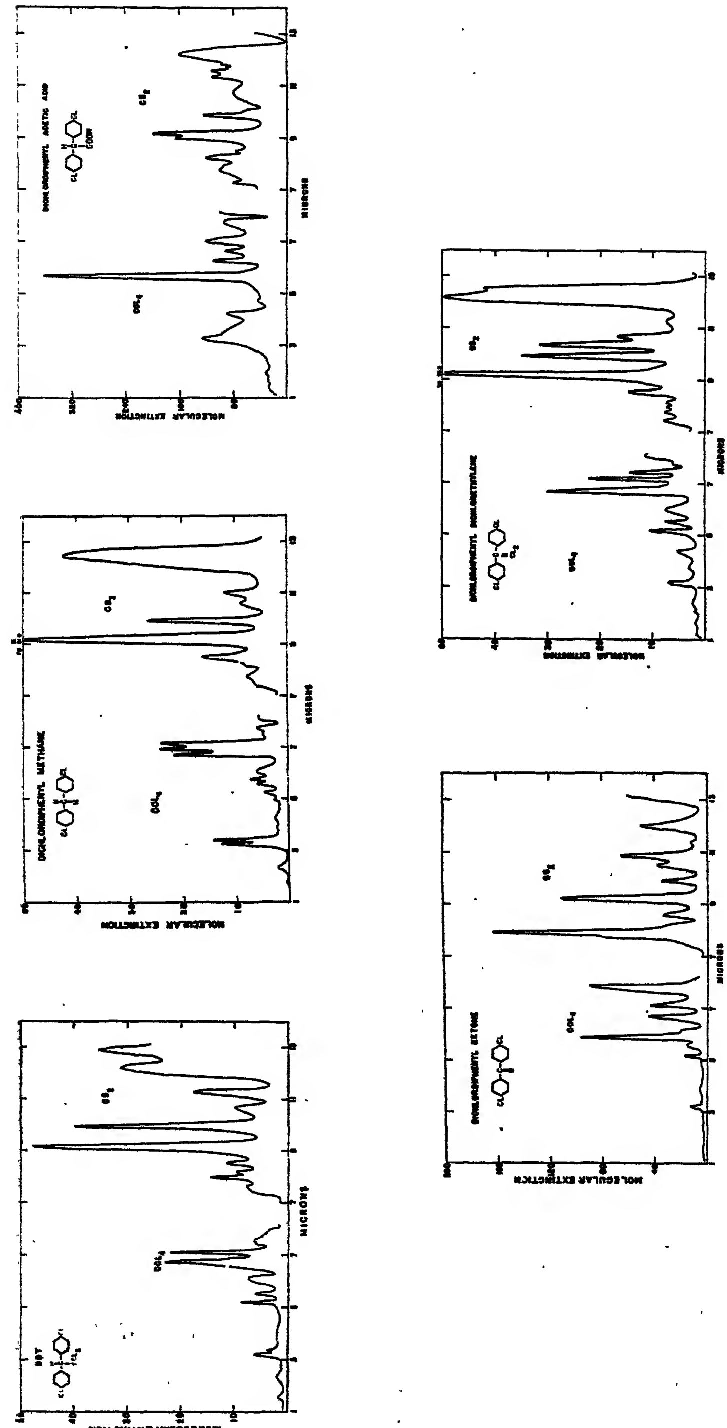

Figure 2.—Infrared absorption spectra of DDT and four related compounds.

found in other diphenyl compounds described in the literature (*3*). All have a rather complex structure from 9 to 13 microns with several bands which have not been correlated with known linkages.

The 9.2-micron band offers the best possibility for the detection of DDT in the absence of interfering substances. From the intensity of this band it appears that about 200 micrograms of DDT are required for measurement. The limits of detection for the other four compounds studied vary somewhat but are of the same order of magnitude as for DDT.

There are enough differences between the absorption curves to permit the determination of any one of the five compounds in the presence of any combination of the others.

As can be seen from the figure, the curves with the two solvents do not agree in the overlapping wave-length region. This is probably due to interaction and emphasizes that the same solvent must be used if comparable results are to be obtained. If a technique for obtaining suitable crystalline layers can be developed, this will be the method of choice since the solvent difficulties will be eliminated.

DDT CRYSTALLOGRAPHY

DDT crystallizes from most of its solvents in colorless, acicular crystals, usually twinned along their length. The crystals are very soft and friable with no evident cleavage plane and with uneven and somewhat splintery fracture. The specific gravity as measured in a 25-ml. pycnometer, using an aerosol wetting agent to assure complete removal of occluded-air bubbles, is 1.52. Studies with the polarizing microscope show that DDT crystals are biaxial and optically positive. They show parallel extension and 2 V is large. The indices of refraction were measured with sodium light by the immersion method, using solutions of potassium mercuric iodide as immersion media. The indices are: $\alpha=1.628$; $\beta=1.64$; $\gamma=1.695$. These values agree fairly well with crystallographic data by E. L. Gooden (*4*) and I. Fankuchen, M. Schneider, and J. Singer (*5*).

The X-ray diffraction patterns of DDT (*1*) and dichlordiphenyl acetic acid (*2*) have been previously reported but will be repeated here for comparison with the other derivatives in this series. The X-ray diffraction patterns (fig. 3) were obtained, using the powder-wedge technique in a cylindrical camera with 7.16-cm. radius exposed to radiation from a copper anode X-ray tube with a nickel-foil filter giving essentially Cu_{K_α} radiation. The interplanar spacings (d) and the relative intensities (as measured on a microphotometer) for DDT and the four derivatives studied are given in table 1. There are enough differences between the patterns to permit the detection of individual components in mixtures in some cases. The DDT pattern, although somewhat weaker than the others, is sufficiently distinctive for easy identification.

The X-ray diffraction pattern of DDT is of sufficient intensity to permit its identification in a dust sample when present in a concentration of 10 percent or more. The actual amount of DDT detectable by its diffraction pattern is about 1 mg. The other compounds can be detected in somewhat smaller concentrations.

TABLE 1.—*X-ray powder diffraction data for DDT, dichlordiphenyl dichlorethylene, dichlordiphenyl acetic acid, dichlordiphenyl methane, and dichlordiphenyl ketone*

DDT		Dichlordiphenyl dichlorethylene		Dichlordiphenyl acetic acid		Dichlordiphenyl methane		Dichlordiphenyl ketone	
d	I/Io	d	I/Io	d	I/Io	d	I/Io	d	I/Io
9.6	0.54	8.9	0.23	13.3	0.07	6.9	0.08	4.87	0.60
5.9	.88	8.3	.07	5.66	.33	6.6	.05	4.80	.43
5.4	.50	7.7	.11	4.73	1.00	5.5	.17	4.51	.15
4.98	1.00	6.9	.04	4.38	.53	4.9	.11	4.34	.11
4.81	.21	6.1	.04	4.18	.45	4.58	1.00	3.84	.11
4.43	.96	4.85	1.00	3.84	.28	4.27	.25	3.69	1.00
4.20	.79	4.65	.44	3.70	.30	3.76	.11	3.14	.65
4.10	.42	4.36	.30	3.54	.27	3.56B	.60	3.02	.43
3.86B[1]	.38	4.20	.46	3.40	.17	3.42	.02	2.90B	.15
3.78B	.25	4.04	.49	3.28	.38	3.35	.19	2.80	.04
3.60	.46	3.89B	.47	3.18	.05	3.20	.02	2.48	.10
3.51	.50	3.82	.33	3.06	.57	3.15	.14	2.43	.08
3.35	.67	3.70B	.21	2.96	.03	3.07	.30	2.34	.07
3.25	.21	3.56	.46	2.89	.07	3.00	.16	2.24B	.10
3.16	.38	3.46	.56	2.80	.08	2.91	.13	2.15	.15
3.05B	.83	3.37	.11	2.66	.13	2.86	.14	2.11	.11
2.94B	.67	3.27B	.51	2.55	.13	2.73B	.04	2.08	.11
2.83	.33	3.08	.30	2.47	.05	2.49	.04	2.03	.15
2.78	.46	3.02	.53	2.39	.07	2.43	.05	1.96	.06
2.73	.69	2.95	.44	2.28	.06	2.39	.04	1.90	.30
2.68	.13	2.86B	.12	2.18	.07	2.30	.04	1.812	.10
2.60	.15	2.79	.07	2.14	.12	2.27	.04	1.794	.10
2.52B	.25	2.70	.05	2.10	.03	2.24	.04	1.741	.10
2.47	.08	2.58	.07	2.06	.05	2.20	.04	1.722	.10
2.40	.19	2.49	.12	1.90	.12	2.12B	.02	1.540	.10
2.30	.25	2.44	.06			2.02	.04	1.397	.05
2.25B	.29	2.26B	.11			1.95	.04	1.356	.05
2.19	.10	2.17	.16			1.90	.04	1.218	.05
2.17	.06	2.12	.04			1.855	.04	1.190	.05
2.04	.38	2.09	.16			1.824	.04		
2.01	.29	2.05	.04			1.784	.04		
1.98	.15	1.98	.16			1.705	.04		
1.93	.10	1.96	.10			1.682	.02		
1.888B	.15	1.92	.10			1.654	.04		
1.856	.06	1.88	.10			1.583	.02		
1.839	.10	1.828	.10						
1.786	.06	1.801	.10						
1.768	.06	1.770	.10						
1.744	.38	1.720	.07						
1.691	.06	1.682	.07						
1.675	.10	1.571	.04						
1.629	.10	1.505	.10						
		1.445	.07						
		1.411	.07						

[1] B designates a broad line.

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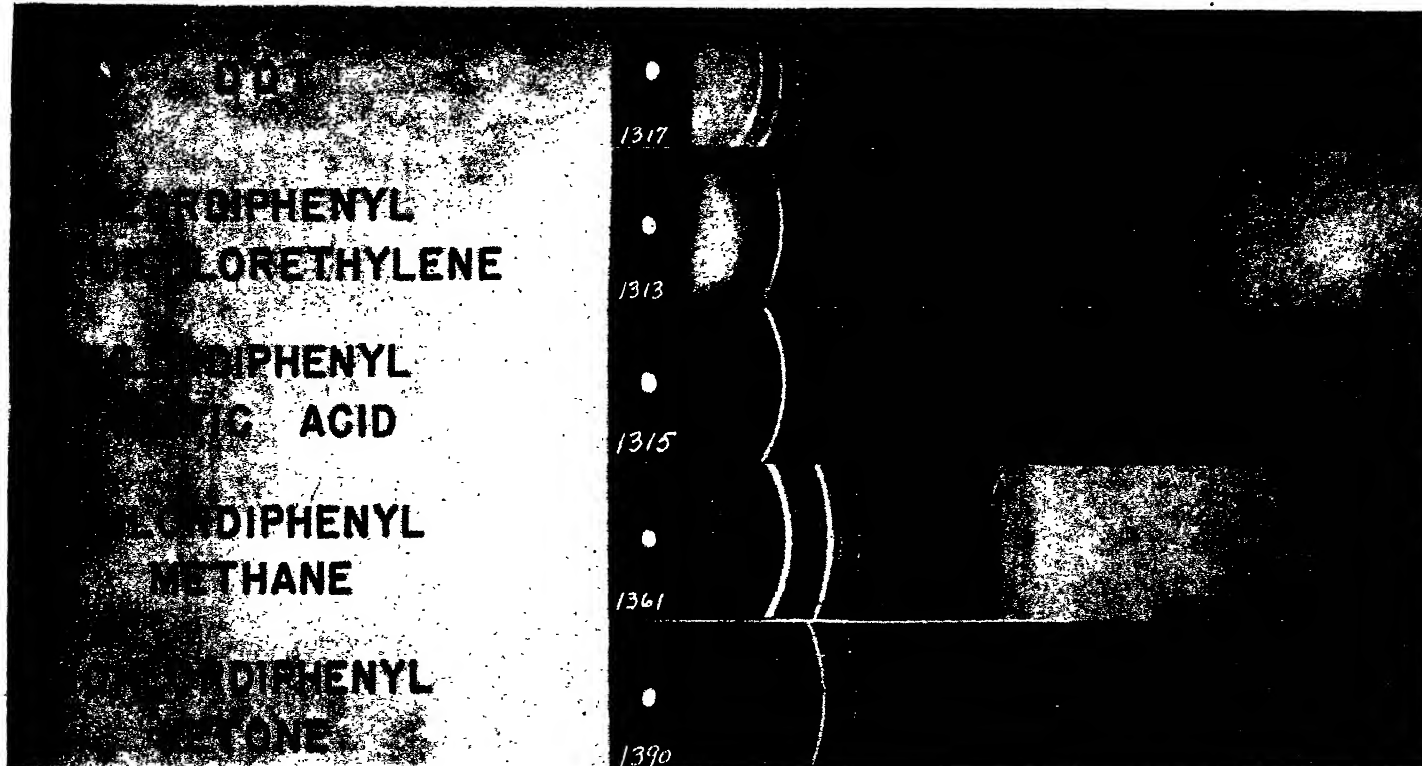

FIGURE 3.—X-ray diffraction pattern.

DEATHS DURING WEEK ENDED MARCH 2, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 2, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	10,371	9,866
Average for 3 prior years	9,850	
Total deaths, first 9 weeks of year	94,375	88,258
Deaths under 1 year of age	625	689
Average for 3 prior years	673	
Deaths under 1 year of age, first 9 weeks of year	5,479	5,752
Data from industrial insurance companies:		
Policies in force	67,181,267	67,079,160
Number of death claims	15,894	16,293
Death claims per 1,000 policies in force, annual rate	12.3	12.7
Death claims per 1,000 policies, first 9 weeks of year, annual rate	11.3	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 9, 1946

Summary

A total of 5,532 cases of influenza was reported for the week, as compared with 5,337 last week and a 5-year median of 4,744. Decreases occurred in all geographic areas except the South Atlantic and West South Central. The increase in the latter area was accounted for chiefly by an increase in Texas from 1,792 last week to 2,830 for the current week. The total for the year to date is 165,882, as compared with 43,198 and 310,953, respectively, for the corresponding periods of 1945 and 1944, and a 5-year median of 49,557.

The incidence of diphtheria declined from 361 cases last week to 325 cases for the current week. The largest number reported for a corresponding week of the past 5 years is 340 cases in 1942. States reporting more than 9 cases each are Texas (48), New York (23), Pennsylvania (21), Ohio (20), Illinois and California (18 each), Maryland (17), Indiana (14), Mississippi (12), and North Carolina and Michigan (11 each). The total to date is 3,898, as compared with 3,160 for the same period last year and a 5-year median of 2,951.

Of the total of 28,440 cases of measles reported, as compared with 24,790 last week and 21,511 for the 5-year median, 15,395, or 54 percent, occurred in the Middle Atlantic and East North Central areas. Increases occurred in 4 of the 6 States reporting more than 1,000 cases each—New Jersey, Michigan, Texas, and California. A total of 122,429 cases has been reported for the year to date, as compared with 20,173 for the corresponding period last year, and 207,252 in 1944. The latter figure is the largest number reported for the corresponding period of any of the past 5 years. The 5-year median for the period is 136,443.

Of the total of 37 cases of poliomyelitis reported for the week, as compared with 52 last week and a 5-year median of 19, California

reported 8, Texas 7, and Florida 3. The total to date, 443 cases, is more than reported for the corresponding period of any of the past 5 years.

The total of 202 cases of meningitis was the same number as reported last week. Of these, California reported 23, Texas 19, New York 17, Pennsylvania and Ohio 16 each, and Illinois 14. The cumulative total is 2,047, as compared with 2,548 and 5,590, respectively, for the corresponding periods of 1945 and 1944, and a 5-year median of 2,548.

Deaths registered during the week in 92 large cities of the United States aggregated 9,855, as compared with 10,355 last week, 9,549 and 9,510, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,740. The total to date is 103,879, as compared with 97,466 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended Mar. 9, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria: Week ended— Mar. 9, 1946	Diphtheria: Week ended— Mar. 10, 1945	Diphtheria: Median 1941–45	Influenza: Week ended— Mar. 9, 1946	Influenza: Week ended— Mar. 10, 1945	Influenza: Median 1941–45	Measles: Week ended— Mar. 9, 1946	Measles: Week ended— Mar. 10, 1945	Measles: Median 1941–45	Meningitis, meningococcus: Week ended— Mar. 9, 1946	Meningitis, meningococcus: Week ended— Mar. 10, 1945	Meningitis, meningococcus: Median 1941–45
NEW ENGLAND												
Maine	1	0	0	11	------	------	23	8	205	0	0	2
New Hampshire	0	0	0	------	------	------	------	5	18	0	0	0
Vermont	0	0	0	------	------	------	4	15	17	0	1	1
Massachusetts	5	4	4	------	------	------	484	117	594	4	6	7
Rhode Island	0	0	0	1	59	17	9	5	38	[a]1	0	0
Connecticut	1	0	0	9	2	3	143	191	307	0	4	4
MIDDLE ATLANTIC												
New York	23	9	19	[1] 2	[1] 4	[1] 12	3,677	94	1,941	17	29	29
New Jersey	1	2	3	10	9	9	1,660	44	1,417	6	10	10
Pennsylvania	21	11	10	4	3	2	2,833	149	1,323	16	26	26
EAST NORTH CENTRAL												
Ohio	20	10	10	8	12	19	349	28	450	16	16	11
Indiana	14	10	5	54	5	12	728	40	222	2	7	7
Illinois	18	2	14	9	2	21	1,939	80	887	14	16	16
Michigan [2]	11	10	5	2	4	8	3,383	53	630	4	14	12
Wisconsin	0	0	1	81	27	44	826	41	873	3	3	3
WEST NORTH CENTRAL												
Minnesota	7	2	2	3	------	1	41	11	45	2	2	2
Iowa	4	5	3	------	------	6	47	80	244	0	7	0
Missouri	6	4	4	6	2	7	442	4	365	9	8	8
North Dakota	2	4	1	8	1	9	------	3	102	1	2	0
South Dakota	1	6	4	------	------	------	82	15	15	0	2	0
Nebraska	2	1	2	17	1	4	85	25	153	1	1	1
Kansas	1	10	5	4	1	17	912	25	460	0	3	3
SOUTH ATLANTIC												
Delaware	3	0	0	------	------	------	38	10	22	0	0	0
Maryland [2]	17	5	5	8	3	10	320	59	104	3	4	4
District of Columbia	0	0	0	2	------	2	152	12	72	2	0	2
Virginia	7	2	9	467	743	696	531	51	650	3	8	10
West Virginia	5	3	4	16	18	19	94	50	338	3	5	5
North Carolina	11	10	8	------	------	16	323	25	649	6	4	4
South Carolina	7	6	5	830	522	705	463	24	194	3	1	3
Georgia	7	7	6	67	25	119	459	55	320	3	2	2
Florida	3	11	1	11	1	10	89	81	207	2	10	3
EAST SOUTH CENTRAL												
Kentucky	9	4	4	88	1	20	739	4	95	9	4	4
Tennessee	4	7	7	47	70	155	246	98	330	3	11	11
Alabama	5	9	6	244	229	229	175	11	132	1	6	6
Mississippi [2]	12	8	8	------	------	------	------	------	------	6	4	4
WEST SOUTH CENTRAL												
Arkansas	1	11	6	128	107	147	128	47	152	6	9	2
Louisiana	5	7	4	152	2	27	286	110	136	6	7	5
Oklahoma	3	5	5	99	231	107	113	20	36	1	5	3
Texas	48	27	40	2,830	1,689	1,653	1,541	736	1,261	19	15	15
MOUNTAIN												
Montana	1	1	0	28	12	14	23	1	80	0	1	1
Idaho	1	5	0	40	2	------	36	1	85	0	0	0
Wyoming	0	0	0	1	25	14	35	7	48	0	0	0
Colorado	4	4	6	35	24	42	331	14	256	0	0	0
New Mexico	1	2	1	1	------	3	10	2	50	0	0	0
Arizona	4	0	0	122	78	142	70	8	170	1	0	0
Utah [2]	0	0	0	5	43	29	545	93	93	2	0	0
Nevada	0	0	0	------	8	5	1	9	9	0	0	0
PACIFIC												
Washington	8	9	3	------	4	7	881	129	180	3	6	6
Oregon	3	3	1	18	8	27	296	45	97	1	5	3
California	18	25	19	64	21	104	2,848	953	953	23	20	20
Total	325	261	265	5,532	3,998	4,744	28,440	3,688	21,511	202	284	284
10 weeks	3,898	3,160	2,951	165,882	43,198	49,557	122,429	20,173	136,443	[a]2,047	2,548	2,548

[1] New York City only.
[2] Period ended earlier than Saturday.
[a] Correction: Meningococcus meningitis, week ended Feb. 23, Rhode Island 1 case (instead of 0).

Telegraphic morbidity reports from State health officers for the week ended Mar. 9, 1946 and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1940–44
	Mar. 9, 1946	Mar. 10, 1945		Mar. 9, 1946	Mar. 10, 1945		Mar. 9, 1946	Mar. 10, 1945		Mar. 9, 1946	Mar. 10, 1944	
NEW ENGLAND												
Maine	0	0	0	51	53	20	0	0	0	0	0	0
New Hampshire	0	0	0	3	9	9	0	0	0	0	0	0
Vermont	1	0	0	13	23	5	0	0	0	0	0	0
Massachusetts	2	1	0	219	376	381	0	0	0	3	2	1
Rhode Island	0	0	0	9	42	18	0	0	0	0	0	0
Connecticut	1	0	0	43	91	81	0	0	0	0	0	1
MIDDLE ATLANTIC												
New York	0	14	1	594	581	536	0	0	0	4	2	4
New Jersey	0	0	0	121	171	208	0	0	0	2	0	0
Pennsylvania	1	0	0	468	710	637	0	0	0	8	8	5
EAST NORTH CENTRAL												
Ohio	1	2	2	490	442	404	1	0	0	0	0	2
Indiana	2	0	0	129	152	152	1	0	1	0	3	2
Illinois	1	1	1	265	429	429	0	0	0	1	1	1
Michigan [2]	0	0	0	197	361	276	0	1	0	1	0	1
Wisconsin	0	0	0	173	319	319	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	58	115	110	0	0	0	2	0	0
Iowa	0	0	0	57	101	67	0	0	0	0	0	1
Missouri	0	0	0	75	100	123	0	1	1	1	1	1
North Dakota	0	0	0	11	38	26	0	0	0	0	0	0
South Dakota	0	0	0	17	16	22	0	0	0	0	1	0
Nebraska	0	0	0	39	81	40	0	0	0	1	0	1
Kansas	1	1	1	90	127	101	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	11	12	12	0	0	0	0	0	0
Maryland [2]	0	0	0	129	252	88	0	0	0	0	0	0
District of Columbia	0	0	0	36	65	26	0	0	0	1	0	0
Virginia	0	1	0	77	142	53	0	0	0	2	1	1
West Virginia	1	0	0	33	66	48	0	0	0	0	0	0
North Carolina	0	1	0	50	97	43	0	0	0	0	0	0
South Carolina	0	0	0	9	17	10	0	0	0	6	1	1
Georgia	0	2	0	16	34	23	0	0	0	3	2	2
Florida	b 3	0	0	7	7	7	0	0	0	2	1	2
EAST SOUTH CENTRAL												
Kentucky	0	1	1	59	40	76	0	0	0	0	0	1
Tennessee	1	3	0	28	97	97	0	0	0	1	2	2
Alabama	0	0	1	16	16	16	0	0	0	0	1	1
Mississippi [2]	1	1	0	8	47	15	0	2	0	3	2	2
WEST SOUTH CENTRAL												
Arkansas	b 0	0	0	2	27	13	1	2	2	1	1	1
Louisiana	2	1	0	10	13	7	0	0	0	3	3	3
Oklahoma	1	0	0	24	25	22	0	0	1	0	1	1
Texas	7	4	1	99	114	64	3	0	1	2	1	2
MOUNTAIN												
Montana	2	0	0	9	14	19	0	0	0	0	1	0
Idaho	0	0	0	8	58	8	0	0	0	0	0	0
Wyoming	0	0	0	33	94	23	0	0	0	1	0	0
Colorado	0	0	0	49	82	49	0	1	1	1	3	1
New Mexico	0	0	0	3	27	9	0	0	0	0	2	0
Arizona	0	0	0	18	31	17	0	0	0	0	3	1
Utah [2]	0	0	0	27	69	64	0	0	0	0	0	0
Nevada	0	0	0	0	17	4	0	1	0	0	0	0
PACIFIC												
Washington	1	0	1	38	95	39	0	0	0	0	0	1
Oregon	0	0	1	37	30	12	0	0	0	1	0	2
California	8	0	1	213	488	197	3	0	0	6	0	1
Total	37	33	19	4,171	6,413	5,036	9	8	16	56	43	53
10 weeks	b 443	373	276	32,501	54,810	39,658	72	94	207	423	568	734

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 2; New York 1; New Jersey 1; Georgia 1; Florida 1; Arkansas 1; Louisiana 1; Oregon 1.

Telegraphic morbidity reports from State health officers for the week ended Mar. 9, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Mar. 9, 1946	Whooping cough: Week ended— Mar. 10, 1945	Whooping cough: Median 1941–45	Week ended Mar. 9, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	12	24	30	1							1
New Hampshire		5	3								
Vermont	14	65	31								
Massachusetts	146	131	197		8						
Rhode Island	46	39	38								
Connecticut	69	67	67	1							2
MIDDLE ATLANTIC											
New York	220	261	361	5	7		2				3
New Jersey	154	123	123	3		3					
Pennsylvania	123	119	211				4				1
EAST NORTH CENTRAL											
Ohio	104	127	150	1							
Indiana	19	10	17				1				
Illinois	104	60	98	2			3				6
Michigan [3]	123	147	164							[4] 1	
Wisconsin	75	66	145						1		2
WEST NORTH CENTRAL											
Minnesota	9	20	50	1							5
Iowa	10	2	28								
Missouri	6	14	14								1
North Dakota			5								
South Dakota		1	6								3
Nebraska		14	14								
Kansas	73	49	49								7
SOUTH ATLANTIC											
Delaware	3	2	2								
Maryland [3]	23	41	45			1					
District of Columbia	4	2	6								
Virginia	35	44	74	1		12	1		2	1	
West Virginia	31	33	33								
North Carolina	55	95	122	5	3		2				
South Carolina	69	107	80	4	4				1	1	
Georgia	7	16	17		4				4	4	5
Florida	15	18	18	2			1			7	
EAST SOUTH CENTRAL											
Kentucky	25	30	42								
Tennessee	36	37	37			1	2		1		2
Alabama	11	19	22							7	2
Mississippi [3]									6	3	4
WEST SOUTH CENTRAL											
Arkansas	6	29	20	1	10				1		
Louisiana	10	5	8		2				1	3	2
Oklahoma	5	20	20		1						
Texas	219	313	256	6	246	47			7	12	10
MOUNTAIN											
Montana		5	6	1							
Idaho	12	4	4								
Wyoming	4	6	3					1			
Colorado	28	32	32		5						2
New Mexico	18	8	17			2					
Arizona	21	21	20			15					1
Utah [3]	26	27	37								
Nevada		1	6								
PACIFIC											
Washington	37	20	35								
Oregon	9	30	30								
California	97	298	205	3	7		3			1	7
Total	2,111	2,614	3,911	37	297	81	19	1	24	40	66
Same week, 1945	2,614			24	287	98	9	0	10	86	94
Average, 1943–44	2,814			48	244	78	11	[5] 0	13	[5] 32	
10 weeks; 1946	18,272			400	2,920	1,099	85	4	213	500	639
1945	23,430			270	5,354	1,379	66	4	208	547	854
Average, 1943–45	26,851		[5] 35,759	260	3,168	803	90	[5] 4	161	[5] 443	

[3] Period ended earlier than Saturday.
[4] Imported.
[5] 5-year median, 1941–45.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 2, 1946

This table lists the reports from 86 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	-------	0	1	0	3	0	0	7
New Hampshire:												
Concord	0	0	------	0	-------	0	5	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	-------	0	0	0	0	0	0	------
Massachusetts:												
Boston	1	0	------	1	82	2	6	0	40	0	0	28
Fall River	0	0	------	0	1	0	2	0	2	0	0	5
Springfield	1	0	------	0	2	0	2	0	9	0	0	1
Worcester	0	0	------	0	25	0	9	0	8	0	0	4
Rhode Island:												
Providence	0	0	2	1	4	0	1	0	10	0	0	46
Connecticut:												
Bridgeport	0	0	------	0	-------	0	0	0	0	0	0	3
New Haven	0	0	2	0	16	0	4	0	3	0	0	1
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	------	0	114	0	5	0	7	0	0	19
New York	14	1	8	0	984	9	77	0	307	0	3	50
Rochester	0	1	------	0	309	0	[illegible]	0	11	0	0	5
Syracuse	0	0	------	0	428	0	3	0	4	0	0	1
New Jersey:												
Camden	0	0	------	0	59	0	0	0	0	0	0	1
Newark	0	0	------	0	649	0	3	0	8	0	0	26
Trenton	0	0	------	0	1	0	4	0	3	0	0	2
Pennsylvania:												
Philadelphia	0	0	5	2	971	6	28	0	66	0	1	14
Pittsburgh	2	0	2	0	3	2	6	0	16	0	0	5
Reading	0	0	------	2	352	0	1	0	1	0	0	30
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	------	0	104	1	13	0	18	0	0	4
Cleveland	2	0	2	1	15	2	9	0	38	0	0	12
Columbus	1	0	1	1	4	1	2	0	13	0	0	5
Indiana:												
Fort Wayne	0	0	------	0	1	0	1	0	1	0	0	4
Indianapolis	7	0	------	0	308	0	4	0	22	0	0	16
South Bend	0	0	------	0	-------	0	0	0	3	0	0	1
Terre Haute	0	0	------	0	-------	0	3	0	4	0	0	------
Illinois:												
Chicago	0	0	3	1	1,196	10	34	0	74	0	0	53
Michigan:												
Detroit	6	1	4	0	1,572	6	15	0	48	0	0	35
Flint	0	0	------	0	10	0	2	0	5	0	0	3
Grand Rapids	0	0	------	0	85	1	0	0	7	0	0	3
Wisconsin:												
Kenosha	0	0	------	0	-------	1	0	0	6	0	0	------
Milwaukee	0	0	1	1	434	1	6	0	34	0	0	23
Racine	0	0	------	0	1	0	1	0	4	0	0	1
Superior	0	0	------	0	-------	0	0	0	2	0	0	5
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	4	0	0	0	3	0	0	1
Minneapolis	2	0	------	0	16	2	4	0	15	0	0	------
St. Paul	2	0	------	0	2	0	4	0	11	0	0	------
Missouri:												
Kansas City	0	0	4	0	216	0	11	0	4	0	0	1
St. Joseph	0	0	------	0	15	0	0	0	0	0	0	------
St. Louis	2	0	3	0	53	0	8	0	23	0	0	1

City reports for week ended Mar. 2, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	17	0	11	0	5	0	0	------
Kansas:												
Topeka	0	0	------	0	230	1	3	0	9	0	0	3
Wichita	0	1	------	0	51	0	4	0	6	0	0	5
SOUTH ATLANTIC												
Delaware:												
Wilmington	2	0	------	0	16	0	4	0	2	0	0	------
Maryland:												
Baltimore	7	0	2	2	202	6	8	0	43	0	0	8
Cumberland	0	0	------	0	------	0	0	0	4	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	1	0	124	0	5	1	25	0	0	6
Virginia:												
Lynchburg	0	0	------	0	4	0	1	0	1	0	0	8
Richmond	0	0	------	2	8	0	0	0	14	0	1	5
Roanoke	0	0	------	0	3	0	0	0	1	0	1	------
West Virginia:												
Wheeling	1	0	------	1	6	0	1	0	1	0	0	5
North Carolina:												
Raleigh	0	0	------	0	19	0	1	0	1	0	0	------
Wilmington	0	0	------	0	17	0	0	0	1	0	0	1
Winston-Salem	0	0	------	0	2	1	3	0	2	0	0	3
South Carolina:												
Charleston	0	0	10	0	14	0	0	0	0	0	0	2
Georgia:												
Atlanta	*0	0	1	1	1	0	1	0	5	0	1	4
Brunswick	0	0	------	0	1	0	1	0	0	0	0	------
Savannah	0	0	------	0	4	1	1	0	2	0	0	------
Florida:												
Tampa	0	0	------	0	33	2	6	0	0	0	0	2
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	4	1	35	0	14	0	9	0	0	1
Nashville	1	0	------	0	26	1	0	0	2	0	0	------
Alabama:												
Mobile	1	0	7	1	2	2	0	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	14	0	1	0	1	0	2	0	0	1
Louisiana:												
New Orleans	0	0	2	0	7	3	12	0	6	0	1	1
Shreveport	0	0	------	0	------	0	3	0	2	0	0	------
Texas:												
Dallas	0	0	1	1	------	0	6	0	1	0	0	------
Galveston	0	0	------	0	3	0	1	0	1	0	0	------
Houston	4	0	------	1	2	1	14	0	7	0	0	1
San Antonio	1	0	10	2	18	0	6	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	1	0	0	------
Great Falls	0	0	------	0	1	0	1	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	2	0	------	0	------	0	2	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	2	0	0	0	0	0	0	------
Colorado:												
Denver	1	0	9	0	121	1	5	0	14	0	0	9
Pueblo	0	0	------	0	2	0	1	0	2	0	0	------
Utah:												
Salt Lake City	0	0	------	1	69	0	1	0	9	0	0	3

*Delayed report, Atlanta, 5 cases in prior weeks.

City reports for week ended March 2, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	5	0	------	1	295	0	3	0	9	1	0	7
Spokane	0	0	4	1	110	0	4	0	5	0	0	4
Tacoma	0	0	------	0	29	0	1	0	2	0	0	8
California:												
Los Angeles	2	0	29	4	218	3	7	1	60	0	0	19
Sacramento	0	0	1	1	51	0	0	0	0	0	0	------
San Francisco	1	0	6	2	386	2	10	1	23	1	1	1
Total	71	4	138	32	10,166	68	420	3	1,112	2	9	524
Corresponding week, 1945	54	------	85	24	656	------	468	------	1,859	3	11	627
Average, 1941-45	68	------	308	[1] 44	[2] 5,155	------	[1] 502	------	1,686	1	13	797

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Dysentery, amebic.—Cases: Boston, 2; New York, 3; Detroit, 1; Minneapolis, 1; Baltimore, 1.
Dysentery, bacillary.—Cases: New York, 1; Detroit, 2; Tampa, 1; Los Angeles, 1.
Dysentery, unspecified.—Cases: Cincinnati, 1; San Antonio, 2.
Tularemia.—Cases: New York, 1; Memphis, 1.
Typhus fever, endemic.—Cases: Savannah, 1; New Orleans, 2; Dallas, 1; Houston, 1; Los Angeles, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1943, 33,941,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	5.2	0.0	10.5	5.2	340	5.2	78.4	0.0	199	0.0	0.0	248
Middle Atlantic	7.9	0.9	6.9	1.9	1,791	7.9	60.6	0.0	196	0.0	1.9	71
East North Central	10.4	0.6	6.7	2.5	2,287	14.1	55.2	0.0	171	0.0	0.0	101
West North Central	14.1	2.0	14.1	0.0	1,215	6.0	90.5	0.0	153	0.0	0.0	22
South Atlantic	16.7	0.0	23.4	10.0	760	16.7	53.6	1.7	171	0.0	5.0	74
East South Central	17.1	0.0	94.3	17.1	540	25.7	120.0	0.0	94	0.0	0.0	9
West South Central	14.3	0.0	77.5	11.5	89	11.5	123.4	0.0	57	0.0	2.9	11
Mountain	23.8	0.0	71.5	7.9	1,549	7.9	79.4	0.0	207	0.0	0.0	95
Pacific	12.7	0.0	63.3	14.2	1,722	7.9	39.5	3.2	157	3.2	1.6	62
Total	10.9	0.6	21.3	4.9	1,506	10.5	64.7	0.5	171	0.3	1.4	81

PLAGUE INFECTION IN SAN BENITO COUNTY, CALIF.

Under date of February 28, 1946, plague infection was reported demonstrated on February 23 in squirrels, species not stated, taken in San Benito County, Calif., as follows: In tissue from a lot of 11 squirrels and from another lot of 5 squirrels shot 5 miles and 7 miles, respectively, east of Tres Pinos.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 9, 1946.—During the week ended February 9, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		10		101	271	28	36	43	77	566
Diphtheria		9	6	16	9	1	1		1	43
Dysentery:										
Amebic					40					40
Bacillary				4					2	6
German measles		1		22	22			7	5	57
Influenza		228			139	1			39	407
Measles		43	14	293	1,286		4	9	39	1,688
Meningitis, meningococcus		1	1	3	3				3	11
Mumps				62	113	26	25	42	92	360
Poliomyelitis				1	1					2
Scarlet fever	2	6	5	112	80	14	4	6	25	254
Tuberculosis (all forms)		3	6	72	45	10	20	2	26	184
Typhoid and paratyphoid fever				5	1					6
Undulant fever				3						3
Venereal diseases:										
Gonorrhea		15	81	90	154	55	37	55	90	577
Syphilis		17	12	108	141	24	9	10	35	416
Whooping cough				127	39	1				167

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; P, present]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–December 1945	January 1946	February 1946—week ended—			
				2	9	16	23
ASIA							
Burma	C	[1] 2,871					
Rangoon	C	[2] 65	1				
Ceylon: Trincomalee District	C	19					
China: [3]							
Hupeh Province	C	129					
Kwangsi Province	C	1,266					
Kwantung Province	C	178					
Kweichow Province	C	906					
Shensi Province	C	149					

[1] For the months of July and August 1945.
[2] For the period May 1 to Dec. 31, 1945.
[3] Cholera was also reported present during August in the following Provinces of China: Chekiang, Honan, Hunan, and Kansu.

CHOLERA—Continued

[C indicates cases; P, present]

Place		January–December 1945	January 1946	February 1946—week ended— 2	9	16	23
ASIA—continued							
China—Continued							
Sikong Province	C	113					
Szechwan Province	C	14,748					
Chungking	C	8,000					
Yunnan Province	C	137					
India	C	268,884					
Bombay	C	101					
Calcutta	C	5,298	69	38		65	
Cawnpore	C	202					
Chittagong	C	19	1				
Delhi	C	318					
Madras	C	53	2				
Vizagapatam	C	31					
Indochina: Cochinchina	C	P					
Thailand (Siam): Bangkok	C						

PLAGUE

[C indicates cases; D, deaths; P, present]

Place		January–December 1945	January 1946	February 1946—week ended— 2	9	16	23
AFRICA							
Algeria	C	[1] 14					
Basutoland	C	4					
Bechuanaland	C	19	P				
Belgian Congo	C	[2] 28	2				
British East Africa:							
Kenya	C	93	6				
Uganda	C	6	7				
Egypt	C	225	5			1	3
Alexandria	C		1				3
Ismailiya	C	83					
Port Said	C	84				1	
Suez	C	26	4				
French West Africa	C	5					
Dakar	C	1					
Madagascar	C	181	27				
Morocco (French)	C	811					
Senegal	C	54					
Tunisia	C	3					
Union of South Africa	C	[3] 18					
ASIA							
Burma: Rangoon	C	[4] 21	2				
China:							
Chekiang Province	C	50					
Foochow	C	30					
Kiangsi Province	C	2					
Kirin Province	C	75					
Kwangtung Province	C	17					
Yunnan Province [5]	C	38					
India	C	26,846					
Iraq	C	34					
Palestine	C	46	9	1	1		
Plague-infected rats		42					
EUROPE							
France: Corsica—Ajaccio	C	8					
Great Britain: Malta	C	[6] 75		1			
Italy	C	28					
Portugal: Azores	C	55	4	[7] 5			
Spain: Canary Islands	C	1					
NORTH AMERICA							
Canada: Alberta Province: [8]							
Plague-infected squirrels		2					
SOUTH AMERICA							
Argentina:							
Buenos Aires Province—Plague-infected rats		2					
Santiago del Estero Province	C	2					
Tucuman Province	C	1					

See footnotes at end of table.

PLAGUE—Continued

[C indicates cases; D, deaths, P, present]

Place		January–December 1945	January 1946	February 1946—week ended— 2	9	16	23
SOUTH AMERICA—continued							
Bolivia:							
Santa Cruz Department	C	[9] 79			12		
Tarija Department: Plague-infected rats							P
Brazil:							
Alagoas State	C	1					
Ceara State	C	7					
Pernambuco State	C	90					
Ecuador:							
Canar Province	C	10					
Chimborazo Province	C	6					
Loja Province	C	27					
Peru:							
Ancash Department	C	7					
Ica Department	C	[3] 5					
Lambayeque Department	C	13					
Libertad Department	C	11					
Lima Department	C	16					
Otuzco Department	C	3					
Piura Department	C	6					
Tumbes Province	C	32					
OCEANIA							
Hawaii Territory	D	[10] 1					
Plague-infected rats [11]		17	2				
New Caledonia: Loyalty Islands—Mare Island	C	[12] 60					

[1] Includes 4 cases of pneumonic plague.
[2] Includes 7 suspected cases.
[3] Includes 1 suspected case.
[4] For the period May 1–Dec. 31, 1945.
[5] Information dated July 5, 1945, stated that from April 1944 to May 1945, 85 deaths from plague had occurred in the mountainous region south of Kunming, China.
[6] Includes 4 suspected cases.
[7] Includes 3 suspected cases.
[8] During the month of June 1945, plague infection in fleas was reported in Alberta Province. For the week ended July 25, 1945, plague infection was also reported in 6 pools of fleas in Alberta Province. For the week ended Aug. 11, 1945, 2 pools of plague-infected fleas were reported in Alberta Province, Canada.
[9] Includes 6 suspected cases.
[10] Previously reported as a case, death occurring on June 2, 1945.
[11] Plague infection was also proved positive in a pool of 5 mice on Jan. 4, in a pool of fleas on Feb. 14, in a pool of 10 fleas on Mar. 14, and in a pool of 47 rats on Dec. 15, 1945.
[12] Pneumonic plague.

SMALLPOX

[C indicates cases; P, present]

Place		January–December 1945	January 1946	February 1946—week ended— 2	9	16	23
AFRICA							
Algeria	C	209					
Angola	C	253					
Basutoland	C	362					
Belgian Congo	C	[1] 6,938	[1] 185	[1] 52	[1] 16	[1] 69	
British East Africa:							
Kenya	C	815	55	12	124	12	
Nyasaland	C	170	16	19	9		
Tanganyika	C	5,724					
Uganda	C	1,279	17	5			
Cameroon (French)	C	837	11		[2] 5		
Dahomey	C	330	65				[3] 213
Egypt	C	1,092	41	9	13		
French Equatorial Africa	C	1,715	69				
French Guinea	C	1,724	30				[3] 34
French West Africa: Dakar District	C	401	3				[3] 4
Gambia	C	82		1			
Gold Coast	C	914	208	112	98		
Ivory Coast	C	503	45				[3] 72
Libya	C	25	23	4	2		1
Mauritania	C	85					
Morocco (French)	C	2,673	418				[3] 319
Mozambique	C	1					

See footnotes at end of table.

SMALLPOX—Continued

[C indicates cases; P, present]

Place		January–December 1945	January 1946	February 1946—week ended—			
				2	9	16	23
AFRICA—continued							
Nigeria	C	4,764					
Niger Territory	C	638	57				[3] 77
Rhodesia:							
Northern	C	5,846	69	10			
Southern	C	16					
Senegal	C	504	6				[2] 5
Sierra Leone	C	106	23	36			
Somaliland, British	C	1					
Sudan (Anglo-Egyptian)	C	[4] 5	1	1			
Sudan (French)	C	3,004	786				[3] 213
Togo (British)	C	54					
Toto (French)	C	528	2				[3] 25
Tunisia	C	207	9				
Union of South Africa [5]	C	2,246	P	P	P	P	
ASIA							
Arabia	C	29					
Burma: Rangoon	C	[6] 81	74				
Ceylon	C	[7] 848	188	20		16	
China	C	1,530	50	33			
India	C	231,176					
Indochina (French)	C					25	
Iran	C	400					
Iraq	C	41	2				
Syria and Lebanon	C	14					
Thailand (Siam): Bangkok	C		P				
Trans-Jordan	C	2					
Turkey (see Turkey in Europe).							
EUROPE							
Belgium	C	1					
Czechoslovakia	C		24				
France	C	27	2				
Germany	C	3					
Great Britain:							
England	C	[8] 5			[9] 3	[9] 2	
Scotland	C	[10] 2					
Italy	C	2,724	130				[11] 34
Sicily	C	9					
Portugal	C	29		1			
Spain	C	31					
Canary Islands	C	1					
Turkey	C	297		1		2	3
NORTH AMERICA							
Canada	C	6		2			
Guatemala	C	4					
Honduras	C	8					
Mexico	C	1,426					
Nicaragua	C	[1] 141					
SOUTH AMERICA							
Argentina	C	6	2				
Bolivia	C	1,793					
Brazil	C	[1] 941	9		1		
Colombia	C	1,234	6	2			
Ecuador	C	40	4				
Paraguay	C	1					
Peru	C	230					
Uruguay	C	106					
Venezuela	C	[1] 970	[1] 159				

[1] Includes cases of alastrim.
[2] For the period Feb. 1–10, 1946.
[3] For the period Feb. 1–20, 1946.
[4] Includes 3 imported cases.
[5] For the week ended June 30, 1945, cases of virulent smallpox were reported in the Union of South Africa.
[6] For the period May 1 to Dec. 31, 1945.
[7] Includes some cases of chickenpox.
[8] Includes 2 imported cases.
[9] Imported cases.
[10] Includes 1 imported case.
[11] For the month of February

TYPHUS FEVER*

[C indicates cases; P, present]

Place		January–December 1945	January 1946	February 1946—week ended— 2	9	16	23
AFRICA							
Algeria	C	1,024					
Basutoland	C	120					
Belgian Congo [1]	C	1,091					
British East Africa: Kenya	C	40					
Egypt [1]	C	15,767	247	71	82		
Eritrea	C	81	26	24	19	6	
French West Africa: Dakar [1]	C	20					
Gold Coast	C	1					
Libya: Tripolitania	C	43	6		1	1	2
Madagascar	C	1					
Morocco (French)	C	8,143	343				[2] 351
Morocco (Spanish)	C	8	1				
Nigeria	C	93					
Rhodesia, Northern	C	31					
Sierra Leone [1]	C	11	2				
Tunisia	C	403	6				
Union of South Africa	C	866	P		P	P	
ASIA							
China	C	2,182	6				
India	C	23					
Iran	C	826					
Iraq [1]	C	273	6	5	1		5
Palestine [1]	C	191					
Syria and Lebanon	C	15	27	1	1	1	
Trans-Jordan	C	47	1				
Turkey (see Turkey in Europe).							
EUROPE							
Albania	C	262					
Austria	C	56	9				
Belgium	C	158					
Bulgaria	C	979	52	29	40	52	
Czechoslovakia	C	621	234				
Denmark	C	162					
France	C	512		1			
Germany	C	8,025	184	89			
Gibraltar [1]	C	9					
Great Britain	C	[3] 26					
Malta and Gozo [1]	C	15					
Greece	C	697	30		20		6
Hungary [4]							
Italy	C	193					
Netherlands	C	67					
Norway	C	8					
Poland	C	14,959	837		94		
Portugal	C	53	1				
Rumania	C	9,636					
Spain	C	27					
Sweden	C	226					
Switzerland	C	6					
Turkey	C	2,795	174	27	50	69	83
Yugoslavia	C	14,157					
NORTH AMERICA							
Canada [1]	C	1					
Costa Rica [1]	C	18	3	11	5		
Cuba [1]	C	13	3				
Guatemala	C	2,834					
Jamaica [1]	C	49	5	1	1		
Martinique [1]	C	1					
Mexico	C	1,687					
Panama (Republic)	C	6	1				
Puerto Rico [1]	C	190					
Virgin Islands [1]	C	13					
SOUTH AMERICA							
Argentina	C	9					
Bolivia	C	770					
Brazil	C	8					
Chile [1]	C	655					
Colombia	C	503					
Curacao	C	4					
Ecuador	C	594	106				

See footnotes at end of table.

TYPHUS FEVER—Continued

[C indicates cases; P present]

Place		January-December 1945	January 1946	February 1946—week ended— 2	9	16	23
SOUTH AMERICA—continued							
Paraguay	C	16	1				
Peru	C	771					
Venezuela [1]	C	144	13				
OCEANIA							
Australia [1]	C	116	15				
Hawaii Territory [1]	C	104	9				

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.
[1] Reports cases as murine type.
[2] For the period Feb. 1–20, 1946.
[3] Includes imported cases.
[4] For the period Jan. 1 to Sept. 1, 1945, between 8,000 and 10,000 cases of typhus fever were reported in Hungary.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-December 1945	January 1946	February 1946—week ended— 2	9	16	23
AFRICA							
Gold Coast	C	[1] 13					
Nsawam	C	[2] 3					
Takoradi	C	1					
Tamale	C	[3] 1					
Winneba	C	[4] 4					
Ivory Coast:							
Gaoua	C	1					
Guiglo	C	1					
Sierra Leone: Moyamba	C	2					
Sudan (French): Bamako	C	[3] 1					
SOUTH AMERICA							
Bolivia:							
Beni Department	C	1					
La Paz Department	C	2					
Santa Cruz Department	D		[3] 39				
Brazil:							
Goiaz State	D	76					
Minas Geraes State	D	25					
Para State	D	1					
British Guiana: Kwakwani	C	1					
Colombia:							
Magdalena Department	D	3					
Putumayo Commissary	D	1					
Santander de Norte Department	D	19					
Peru:							
Cuzco Department	C	3					
Junin Department	C	[5] 6					
Loreto Department	C	1					
Venezuela:							
Bolivar State	C	1					
Merida State	C	3					
Tachira State	D	20		[6] 1	[6] 1		
Trujillo State	C		2		1		
Zulia State	C	8	1	3			

[1] Includes 4 suspected cases.
[2] Includes 2 suspected cases.
[3] Suspected.
[4] Includes 1 suspected case.
[5] Includes 3 suspected cases.
[6] Reported as a case.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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IN THIS ISSUE

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EDITORIAL [1]

TEAMWORK IN TUBERCULOSIS CONTROL

Wartime scientific accomplishments have clearly revealed the value of planned, coordinated research in arriving speedily at the solution of definite problems. Not the least repercussion of atomic fission is the stimulus it gives to group activity in research. The atomic bomb destroyed all things; yet it had positive virtue in that it delivered man's mind from old modes of thought and action, and brought to the imaginatiion of all creative thinkers a vision of the future in which no man can go alone.

The achievement of atomic fission is not the consequence of the work of a single man. The story of the community of effort that led to this discovery is widely known. Such organization of time, brains, energy, and money, applied now to current medical problems, could bring, in a future not far away, cures for tuberculosis, heart disease, or cancer. Even though the complexities of the age constantly emphasize the need for teamwork, there will be scientists who will remain intellectually aloof in their ivory towers. Such men have contributed importantly to the progress of science. Nevertheless, experience shows that advancement must largely rely on the efforts of a variety of scientists, whose efforts are cooperatively directed toward the realization of definite goals. The potentialities of planning and teamwork in the field of disease control have not yet been fully realized. Group work here, as elsewhere, can realize results heretofore delayed by inadequate organization and random inquiries.

The Tuberculosis Control Division is one of many groups that profited by the wartime example of the National Research Council in

*This is the second of a series of special issues of PUBLIC HEALTH REPORTS containing articles devoted exclusively to tuberculosis control, which will appear the first week of each month. The series began with the Mar. 1, 1946, issue.

[1] From the Office of the Chief, Tuberculosis Control Division.

the United States and the Medical Research Council of Great Britain. Immediately after its organization the Division instituted as speedily as possible a number of cooperative research projects, which are producing valuable results. The more important of these undertakings have included studies in minimal lesions and pulmonary fungus infections in cooperation with the Medical Research Committee of the National Tuberculosis Association, the University of Kansas, the Kansas City, Mo., and Kansas State health departments; mortality studies in cooperation with the Bureau of the Census; studies in cooperation with the University of Michigan on methods of reproducing X-ray films, investigations into the use of mass radiography in general hospitals, and researches in experimental radiology. Follow-up studies with Temple University of patients discovered to have minimal tuberculosis in industrial surveys are now under way; and studies are being developed at the University of Chicago of the electronic amplification of the fluorescent image and its use in photofluorography. The Electronics Laboratory of the Division in Rockville, Md., cooperates with the National Electrical Manufacturers' Association in studies of methods of standardization of photofluorographic equipment. In addition, the Division materially encourages fundamental research in the unrelenting effort to discover a drug or biologic that will be effective against the tubercle bacillus.

The article in this issue, "Geographic Difference in Sensitivity to Histoplasmin among Student Nurses," is the second in a series on researches carried on by the personnel of the Division. The first article of the series,[2] published May 11, 1945, was recognized as a significant contribution to the epidemiology of tuberculosis.

Many grave problems confront us in the fight against tuberculosis. We must know more about the mode of spread of this insidious disease. We must know why it selects certain age groups and races. And certainly we must learn the secret of its completely successful defense against every drug and biologic now known.

The recent brilliant success of molds and other micro-organisms against venereal disease and other intractable infections has stimulated the search for some chemotherapeutic agent that will prevent entrance of tubercle bacilli into the body, or kill them after they have become secure, or arrest the progress of their destruction.

There have been within the last few years some promising applications of drugs to tuberculous laboratory animals; but at the moment no satisfactory results have been realized from limited experiments on human beings. Even the newest drug, streptomycin, has not proved its efficacy.

Extensive collaborative research, firmly directed, adequately

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[2] Palmer, Carroll E.: Nontuberculous pulmonary calcification and sensitivity to histoplasmin. Pub. Health Rep., 60: 513-520.

financed, and carried forward by the teamwork of many men, must be initiated in even larger measure than before, if tuberculosis is to be eradicated.

GEOGRAPHIC DIFFERENCES IN SENSITIVITY TO HISTOPLASMIN AMONG STUDENT NURSES[1]

By Carroll E. Palmer, *Senior Surgeon, United States Public Health Service*

Several recent papers point to the fact that skin sensitivity to histoplasmin, determined by intradermal testing with the filtrate of a culture of *Histoplasma capsulatum*, is relatively common in certain parts of the United States. Some of this work indicates, also, that there is a close relationship between histoplasmin sensitivity and pulmonary calcification in tuberculin negative reactors. After carefully reviewing the pertinent data of earlier reports, Christie and Peterson (*1*) have presented the results of a study of tuberculin and histoplasmin tests and chest X-ray films of 181 children from middle Tennessee. They find that over 70 percent of the children reacted positively to histoplasmin and suggest that there exists "an immunological relationship between histoplasmin sensitivity and the problem of pulmonary calcification." Similar results relative to the relationship between histoplasmin sensitivity and pulmonary calcification have been reported by Palmer (*2*), from studies on student nurses. Emmons et al. (*3*) find that 40 percent of 136 patients at St. Elizabeths Hospital react to histoplasmin, but on the basis of animal experiments, as well as of human testing, question the specificity of the histoplasmin test, since they were able to show that there are cross reactions between histoplasmin, blastomycin, haplosporangin, and coccidioidin.

Undoubtedly, further study is required to determine whether the reactions to histoplasmin in humans are an indication of infection with *H. capsulatum* or with another organism. It is quite clear, however, that histoplasmin reaction is a specific indication of some previous experience, presumably infectious. The experimental work on fungus infection reported by Emmons et al. supports this interpretation. The high correlation of the histoplasmin reaction with pulmonary calcification is additional strong evidence of the medical significance of the reactions.

In the earlier report of studies on student nurses Palmer has given some indication that there are wide geographic differences in sensitivity to histoplasmin. The present paper, an extension of the work on student nurses, represents an attempt to describe in greater detail

[1] From the Field Studies Section, Tuberculosis Control Division.

the geographic distribution of histoplasmin sensitivity in the United States.

Basic data for the study are derived from the investigation on early tuberculosis being conducted cooperatively by the National Tuberculosis Association and the United States Public Health Service. Over 10,000 student nurses in the participating nursing schools in 11 cities have been given histoplasmin tests. The test consisted of the intradermal injection of 0.1 cc. of a 1/1,000 dilution of a filtrate of broth culture of *H. capsulatum* furnished by Dr. C. W. Emmons, of the National Institute of Health.[2] Measurements of both erythema and induration were recorded at 48 hours, and reactions of 5 or more millimeters of induration were classified as positive. Reactions of less than 5 mm. of induration and those showing only erythema were classified as doubtful. A considerable degree of uniformity of results was assured because essentially all of the tests were given and interpreted by two persons who worked together on the program. About 7,000 tests were made during the spring of 1945, the remainder during the fall of 1945.

The study, therefore, is based on a specific segment of the population, young women mostly between the ages of 18 and 21 years. The fact that approximately 40 percent of the student nurses had been in training less than 12 months at the time of the tests tends to minimize any occupational factor associated with nursing. Nurses present the advantage of control of such variables as age and sex between testing areas throughout the country. Since the proportion of positive reactors undoubtedly would be different among groups of other age and sex, the primary point which this paper seeks to establish is not the actual level of sensitivity to histoplasmin in different areas of the United States, but rather the relative levels of sensitivity in different localities. The actual level of sensitivity to histoplasmin in different areas of the United States is not the primary point which this paper seeks to establish, but rather the relative levels of sensitivity in different localities.

Table 1 gives the percentages of positive and doubtful reactors among 10,580 student nurses tested in 11 cities. For the total groups, 20.1 percent were positive, while 3.2 percent were doubtful reactors. It is clear from the material in table 1 that the percentages of histoplasmin reactors vary greatly in the different cities where the nurses were tested. Among the students tested in the Minneapolis schools, less than 5 percent show a positive reaction, while in the Kansas City, Mo., schools nearly 60 percent were sensitive.

True geographic differences, insofar as specified cities are concerned, are obscured by the fact that the data are based on testing areas rather than on residence. Student nurses from areas where the prevalence

[2] This is the antigen designated as H3 in the paper by Emmons et al. (5).

of histoplasmin reactivity is low often go to nursing schools in regions of high prevalence; and many from the latter regions attend nursing schools where the prevalence is low.

TABLE 1.—*Percentage of histoplasmin reactors among student nurses in specified cities*

Cities	Number of persons tested	Percentage of histoplasmin reactors	
		Positive	Doubtful
Kansas City, Mo.	826	58.1	7.1
Columbus, Ohio	829	57.8	4.0
Kansas City, Kans.	357	45.4	5.3
Baltimore, Md.	1,356	23.6	2.9
New Orleans, La.	693	18.5	6.8
Detroit, Mich.	772	13.2	1.7
Philadelphia, Pa.	884	12.7	2.4
Los Angeles, Calif.	1,403	10.6	3.4
San Francisco, Calif.	824	6.8	1.7
Denver, Colo.	1,147	5.8	1.6
Minneapolis, Minn.	1,489	4.8	1.9
Total	10,580	20.1	3.2

To obtain material for a more precise study of geographic variation, each student nurse was assigned to the State in which she had spent the major part of her life. For the purposes of this paper, nurses who had spent five-sixths or more of their total lifetime in one State are designated as "life-time residents." Of the 10,580 student nurses receiving histoplasmin tests, 8,141, or 77 percent, could be so classified. The definition of what constitutes lifetime residence is obviously somewhat arbitrary. It would, of course, have been more desirable to base the study on nurses who had spent all their lives in one locality. However, it is the rare exception to find persons in the United States who have never left their place of birth, even for a short period. It is realized that occasionally a nurse who may have spent five-sixths of her life in a low prevalence area may have acquired sensitivity during residence in an area of high prevalence. However, the increased reliability of the rates of reactors when more cases are included was considered sufficient to offset the disadvantages of using less rigorous criteria of residency. The definition used would appear to be a reasonable compromise. The analysis given in this paper is based, therefore, on this group of 8,141 so-called lifetime resident nurses. Further, the analysis is limited to rates for positive reactors, doubtful reactors being included in the negative group.

Table 2 shows the distribution of the 8,141 students according to State of lifetime residence. For some States, the number of cases is small and the percentage of positive reactors is calculated and shown only for those for which 50 or more nurses were tested. State boundaries are arbitrary political dividing lines with little significance in a geographic distribution of sensitivity to histoplasmin. Therefore, in order to obtain more meaningful boundaries with respect to

reactions, each State was subdivided into nine sections on the basis of the United States postal sections which are also arbitrary geographical subdivisions, but smaller and less likely to obscure differences. Nurses were classified according to residence within a specific section of a State. In addition, nurses who failed to meet the requirements

TABLE 2.—*Nurses receiving histoplasmin classified by reaction and by lifetime residence* [1]

State of lifetime residence	Nurses receiving histoplasmin		
	Number tested	Number positive	Percent positive
United States	8,141	1,699	20.9
Alabama	26	6	(2)
Arizona	20	1	(2)
Arkansas	34	18	(2)
California	1,195	67	5.6
Colorado	460	4	0.9
Connecticut	8	0	(2)
Delaware	6	0	(2)
District of Columbia	31	14	(2)
Florida	70	3	4.3
Georgia	23	0	(2)
Idaho	12	0	(2)
Illinois	67	24	35.8
Indiana	38	25	(2)
Iowa	132	29	22.0
Kansas	408	159	39.0
Kentucky	22	17	(2)
Louisiana	326	70	21.5
Maine	4	0	(2)
Maryland	502	154	30.7
Massachusetts	17	3	(2)
Michigan	598	49	8.2
Minnesota	937	38	4.1
Mississippi	71	20	28.2
Missouri	389	310	79.7
Montana	23	0	(2)
Nebraska	159	12	7.5
Nevada	16	3	(2)
New Hampshire	4	2	(2)
New Jersey	42	1	(2)
New Mexico	50	5	10.0
New York	88	8	9.1
North Carolina	37	1	(2)
North Dakota	88	1	1.1
Ohio	762	459	60.2
Oklahoma	40	15	(2)
Oregon	7	0	(2)
Pennsylvania	883	121	13.7
Rhode Island	1	0	(2)
South Carolina	11	0	(2)
South Dakota	96	1	1.0
Tennessee	10	4	(2)
Texas	61	21	34.4
Utah	15	1	(2)
Vermont	1	0	(2)
Virginia	48	7	(2)
Washington	16	0	(2)
West Virginia	86	23	26.7
Wisconsin	122	2	1.6
Wyoming	79	1	1.3

[1] Includes only nurses who lived in one State at least five-sixths of a lifetime.
[2] Percentages not shown for States with less than 50 cases tested.

for lifetime residence within any one section of a State but who had lived at least five-sixths of their lives within the boundaries of the State were classified as "State-wide" residents and were added to the total of the nine sections to give the total of lifetime residents of the State in question.

Where contiguous postal sections were similar in prevalence of histoplasmin sensitivity or where the number of reactors was so small as to lack stability, combinations into larger areas were made. Thus, in some instances, the data from several States are combined into broader geographic areas; in other States, mainly in those containing the cities where testing was done, a sufficient number of cases were available to permit analysis on the basis of postal sections or combinations of postal sections. In several instances, several postal sections within a State were included within a contiguous area that had a similar prevalence of histoplasmin sensitivity. Nurses who had only State-wide residence, but could not be assigned to a particular section, were not included in any subdivision by area of prevalence within the State.

Table 3 and figure 1 show the results of assembling the available data to obtain a general view of the frequency of positive histoplasmin

TABLE 3.—*Number and percent of positive reactors among student nurses tested with histoplasmin in specified regions in the United States* [1]

Region	Percent positive	Number positive	Number tested
I	68.3	716	1,049
II	37.5	24	64
III	31.9	252	791
IV	23.1	124	537
V	17.6	16	91
VI	10.1	143	1,422
VII	6.8	42	616
VIII	5.0	43	855
IX	2.8	4	141
X	1.4	20	1,394

[1] Included only nurses who lived in one State at least five-sixths of lifetime. When a State is divided between two or more regions, nurses who lived in more than one section of the State are excluded from any region.

reactors in the country as a whole. The map, figure 1, shows the extremely wide range in frequency of reactors from 1.4 percent in the northwestern part of the country to nearly 70 percent in the eastern central part of the country.

Region I, an area of high prevalence, includes Tennessee, Kentucky, Arkansas, Missouri, Indiana, and parts of Ohio, Illinois, Kansas, and Louisiana, where 716, or 68.3 percent, of 1,049 lifetime residents reacted positively to histoplasmin. Just north of this area, in region II, the southeastern portion of Iowa and northern Illinois showed a

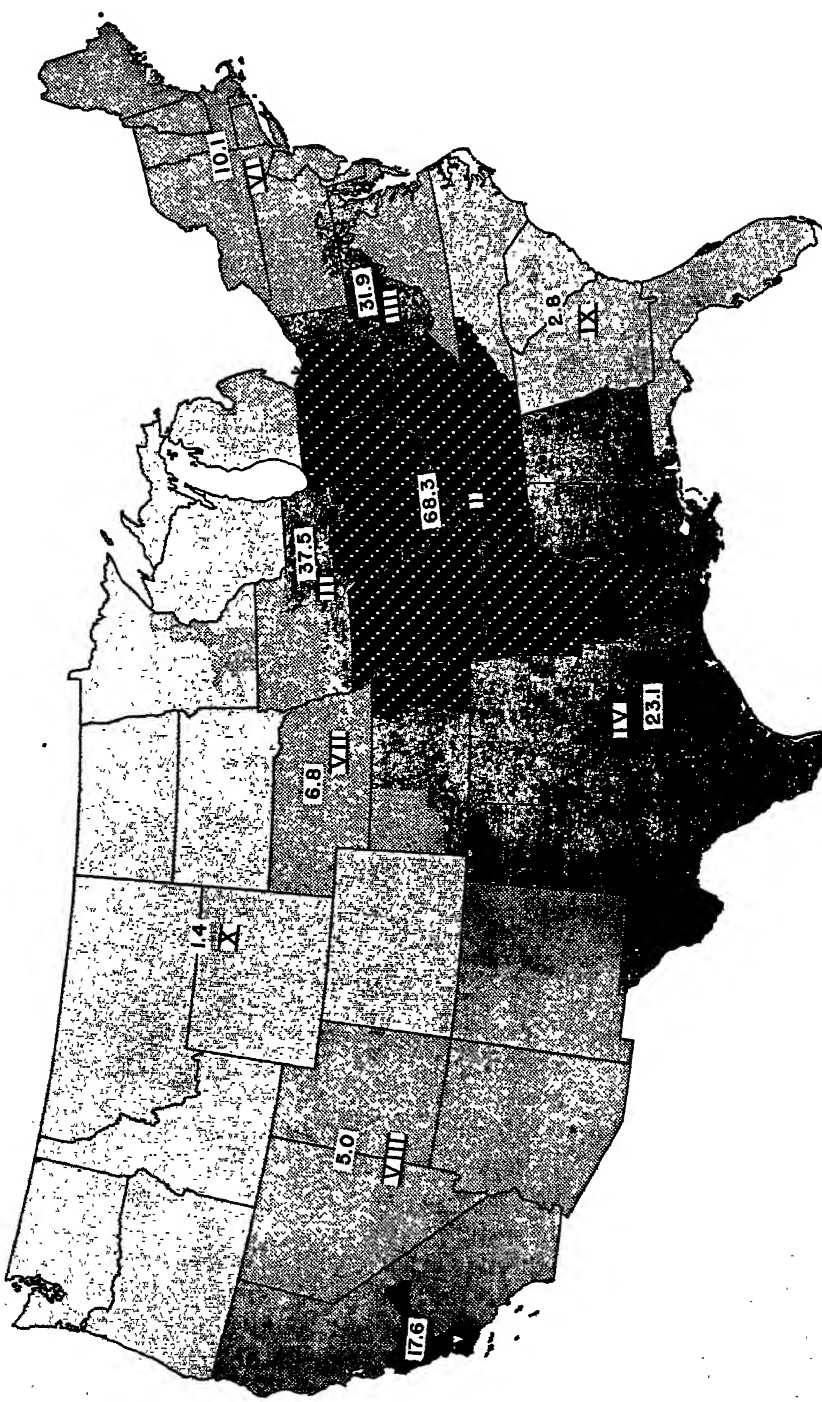

FIGURE 1.—Percentage of positive histoplasmin reactors among student nurses in specified regions of the United States, classified by State of lifetime residence.

rate of 37.5 percent positive reactors, or 24 of 64 lifetime residents. On the eastern border of the high prevalence area, region III, comprising eastern Ohio, south central Pennsylvania, West Virginia, the District of Columbia, and most of Maryland, with 31.9 percent positive, or 252 of 791 nurses, shows a lower rate, but one which is higher than the rest of the Atlantic seaboard. In a quarter-circle west and south of the area of highest prevalence, 124 positive reactors in region IV, central Kansas, Oklahoma, western and southern Louisiana, Mississippi, and Alabama, constitute 23.1 percent of a group of 537 nurses.

Still further away from the area of high prevalence, in the northeastern section of the United States, region VI, consisting of eastern Michigan, New York, the New England States, most of Pennsylvania, New Jersey, Delaware, southern Maryland, and Virginia, only 10.1 percent, or 143 of the 1,422 nurses reacted positively to histoplasmin. Another area of moderate prevalence of histoplasmin sensitivity, region VII, includes northwestern Kansas, Nebraska, northern Iowa, and a strip of southeastern Minnesota, where only 42, or 6.8 percent, from among 616 reacted positively. Region VIII in the southwest section of the United States, including most of California, Nevada, Utah, Arizona, and New Mexico, had only 43 positive reactors or 5.0 percent of 855 lifetime residents. A comparatively high area in central California, region V, showed 17.6 percent, or 16 positive reactors in the 91 lifetime residents.

Two areas of very low prevalence were found in the Northwest and the Southeast. In region IX, in the southern Atlantic States of North Carolina, South Carolina, Georgia, and Florida, only 4 positive reactors, or 2.8 percent, were found among 141 nurses. Similarly, region X, stretching across the northeast northwestern two-thirds of the country from Washington and Oregon to western Michigan, and from Colorado to the Canadian border, contained only 20 positive reactors, or 1.4 percent of the 1,394 residents.

The great importance of geography in any study of this problem is clearly demonstrated by the data presented in table 4 which show the results of the analysis of within-State variations. Maps for 9 States in which testing areas are located are shown in figures 2 and 3. Although Denver is a testing area, no map of Colorado is shown because only 4 positive reactors were observed among 458 lifetime residents.

The most striking geographic variation to be found in the material available for analysis occurs in 3 States, Missouri, Kansas, and Colorado. In northwestern Missouri and northeastern Kansas 78.8 percent of the lifetime residents reacted positively, while in the surrounding area on the east, south, and west, the prevalence dropped to 54.1 percent. Directly to the west, in central Kansas, 21.3 percent of the

nurses reacted positively, while in the northwestern corner of Kansas only 6.9 of the lifetime residents were reactors. Still farther west, in the whole State of Colorado, less than 1 percent reacted. From these data it would seem likely that from the eastern to the western border of Kansas there is change from approximately 80 percent to 1 percent in positive histoplasmin reactors.

TABLE 4.—*Nurses receiving histoplasmin in certain States, classified by section of State of lifetime residence*

Section of State	Nurses receiving histoplasmin		
	Number tested	Number positive	Percent positive
Minnesota:			
I	287	9	3.1
II	346	21	6.1
III	95	0	0.0
Michigan:			
I	99	2	2.0
II	374	29	7.8
California:			
I	297	9	3.0
II	91	16	17.6
III	456	24	5.3
Ohio:			
I	59	51	86.4
II	396	253	63.9
III	118	33	28.0
Louisiana:			
I	217	36	16.6
II	34	19	55.9
Kansas and Missouri:			
I	29	2	6.9
II	122	26	21.3
III	321	253	78.8
IV	122	66	54.1
Pennsylvania and Maryland:			
I	625	59	9.4
II	471	156	33.1
III	20	3	15.0

Ohio, where 60.2 percent of 762 nurses were reactors, showed considerable variation in different parts of the State, although this was not as great as in Kansas. Positive histoplasmin reactors were heavily concentrated in southwestern Ohio with 86.4 percent. The adjoining area on the north and east showed 63.9 percent and the prevalence continued to decrease in eastern Ohio where only 28.0 percent of the nurses were positive.

Louisiana divides into two distinct regions, the northwestern section with 55.9 percent positive, and the remainder of the State with only 16.6 percent positive.

Pennsylvania and Maryland may be considered together because of their geographic proximity. While nearly all of Pennsylvania showed a moderate rate of only 9.4 percent positive reactors, the south central area combines with the northern two-thirds of Maryland to form an area of fairly high prevalence, 33.1 percent. The concentration faded in southern Maryland where only 15 percent of the lifetime residents were positive.

California is a State of fairly marked contrasts in histoplasmin reactivity. In the northern half of the State, only 3.0 percent reacted positively, while the southern portion showed 5.3 percent. Stretching

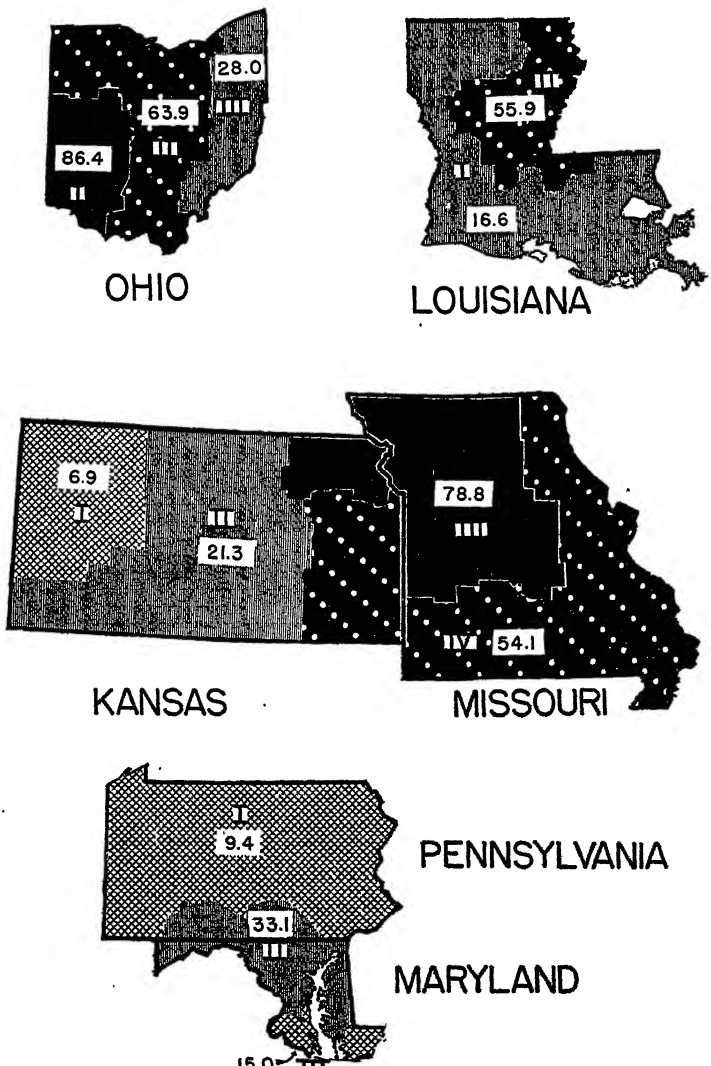

FIGURE 2.—Percentage of positive histoplasmin reactors among student nurses in certain States, classified by section of State of lifetime residence.

nearly across the State between the two areas lies a band of moderate prevalence, 17.6 percent.

Southeastern Michigan, with 7.8 percent, differs from the rest of the State, which contains only 2.0 percent positive reactors.

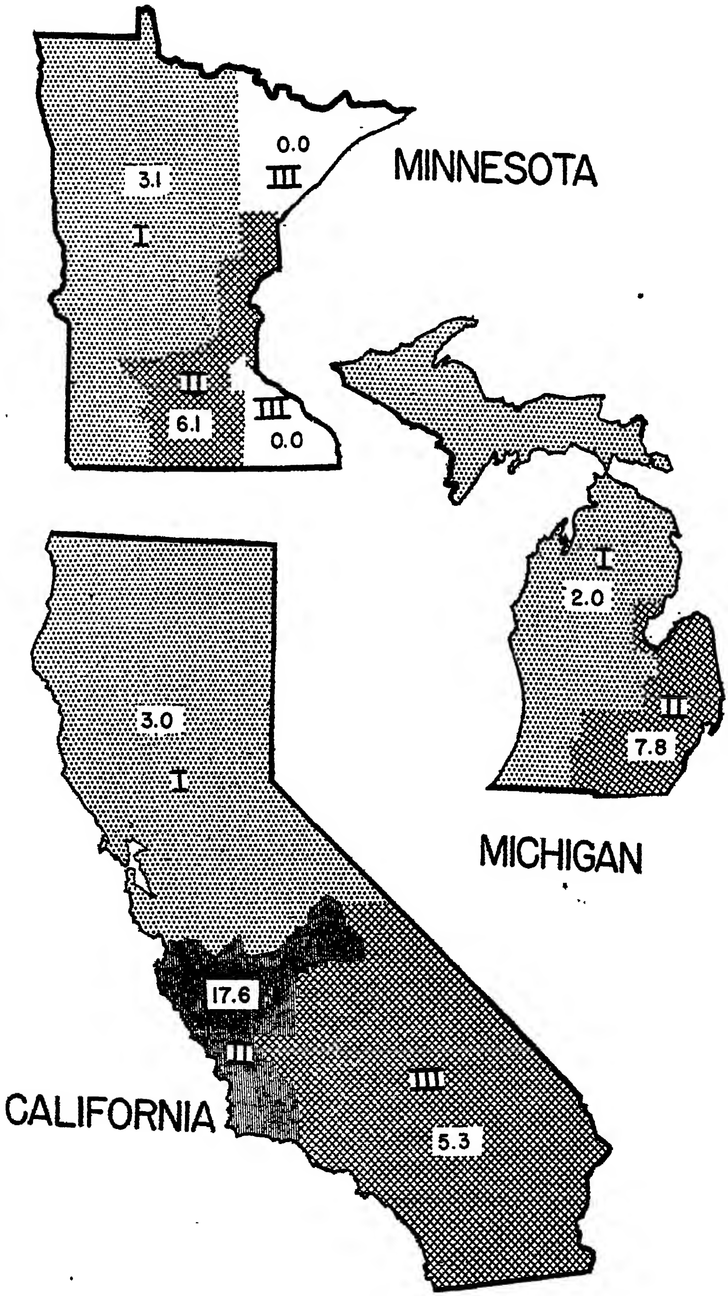

FIGURE 3.—Percentage of positive histoplasmin reactors among student nurses in certain States, classified by section of State of lifetime residence.

Minnesota, a State of very low prevalence of histoplasmin reactivity, had only 38 positive reactors among 934 lifetime residents. The greater part of the State showed an incidence of only 3.1 percent positive reactors; two sections, northeast and southeast, showed none; and an area containing Minneapolis and Northfield went up to 6.1 percent, resembling the situation in northern Iowa directly to the south.

SUMMARY

Analysis, according to place of residence, of the histoplasmin reactions of 8,141 student nurses in connection with a study of early tuberculosis leads to the conclusions: (*a*) That geography appears to be a very significant determining factor in the prevalence of positive reactors; (*b*) that an area of high prevalence of positive histoplasmin reactors exists in the eastern central part of the United States and (*c*) that the frequency of positive reactors, in general, decreases with increasing distance from this area.

ACKNOWLEDGMENT

The author is indebted to a number of persons for assistance in the preparation of this paper. Special thanks are due Dr. Charlotte Silverman and Virginia Trevett for their work on the histoplasmin tests and to Shirley Ferebee for her painstaking work on the statistical analysis. Since the paper forms one report on the cooperative study of minimal tuberculosis in student nurses being supported by the National Tuberculosis Association, special thanks are due Dr. William Charles White and the Medical Research Committee of the Association.

SPECIAL ACKNOWLEDGMENT

In the paper "Nontuberculous Pulmonary Calcifications and Sensitivity to Histoplasmin" (*2*), acknowledgment was made to other workers for suggestions and assistance, but a question has been raised as to the adequacy of some of these references. In this second paper on the subject, I wish to acknowledge unequivocally my indebtedness to many other workers in the field. To make this clear, the following brief history of my work on pulmonary calcification is presented.

My interest in the problem began in 1938, in a study involving tuberculin testing and chest X-ray examinations of about 7,000 school children in Hagerstown, Md. The results showed clearly that a large proportion of the pulmonary calcifications observed could probably not be caused by tuberculosis.

In 1940 I served as statistical consultant on a study subsequently

published by Aronson, et al., "Relationship of Coccidioidomycosis to Calcified Pulmonary Nodules" (*4*), which demonstrated that coccidioidomycosis is probably the cause of pulmonary calcifications in negative tuberculin reactors among Indian children in the southwestern States. It is to this association that I am most indebted both for the original stimulus to consider fungus infections in the study of pulmonary calcifications and for the methodology of showing the relationship by means of skin tests of persons living in different parts of the country.

During 1940 and 1941, in cooperation with Dr. M. L. Furcolow and Dr. W. E. Nelson, a study was undertaken at Xenia, Ohio, which included nearly 500 orphanage children. Some of the unpublished results of this work again emphasized the lack of correlation between tuberculin reactions and pulmonary calcification, but failed to show a relationship of calcification to coccidioidin reactions.

Next, a study of early tuberculosis in student nurses was undertaken in cooperation with the National Tuberculosis Association. Wide geographic coverage was considered important in order to collect data on the difficult problem of calcification in negative tuberculin reactors. A striking geographic distribution of this type of calcification was found. In the fall of 1944 coccidioidin tests on several hundred student nurses in many parts of the country eliminated coccidioidomycosis as the cause of calcification in the localities where this work was done; plans were then made to test for other fungi.

Correspondence with Dr. Amos Christie concerning this problem led to a visit to Vanderbilt University Medical School in February 1945. At that time he showed me the X-ray plates of a small number of patients with negative tuberculin and positive histoplasmin reactions, which he interpreted as suggesting that a mild or subclinical form of histoplasmosis might be causing pulmonary calcification in Tennessee. Although these results did not provide definitive evidence of a relationship they did consitute the reason for my trying histoplasmin next in our continuing Nation-wide study of nurses; the object of this study was to determine whether a statistically valid correlation could be demonstrated.

Dr. Christie kindly furnished histoplasmin for our study on student nurses, but subsequently requested that it be discarded because of contamination. Fortunately Dr. Chester Emmons of the National Institute of Health had some histoplasmin on hand which he generously furnished for this purpose so that the study could proceed as part of the scheduled spring skin-testing program of nurses. Dr. Emmons over the past several years has been very helpful to me and my colleagues as a consultant in mycology.

Though referred to in the previous paper, I should mention again the very special indebtedness of all of us working on this problem

to Dr. C. E. Smith of Stanford University for the suggestion, published in 1943, that histoplasmosis might be the cause of pulmonary calcifications in negative tuberculin reactors in certain areas of the United States.

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TUBERCULOSIS MORTALITY IN THE UNITED STATES AND IN EACH STATE: 1944[1]

By J. Yerushalmy, *Principal Statistician, United States Public Health Service,* and I. M. Moriyama, *Senior Social Science Analyst, United States Bureau of the Census*

During the period of the war, there occurred in the United States more than two deaths from tuberculosis for every three lives lost in combat by the armed forces of the United States. Approximately 206,200 deaths from tuberculosis occurred during the 44 months of war, while the total battle deaths numbered approximately 280,000.[2] This comparison is not presented for the purpose of minimizing war losses, particularly since battle deaths occurred among the healthiest of the population with years of productive life ahead. However, it does serve to emphasize the fact that tuberculosis is still a major public health problem, despite the remarkable progress made in the control of this disease during the past several decades.

The decline in tuberculosis mortality was not interrupted during the war years. In the 3-year period preceding the war (1939–41), there were 181,288 deaths from tuberculosis as compared with 169,426 deaths during the 3-year period 1942–44, a decrease of 11,862, or 6.5 percent, in the number of tuberculosis deaths for the two periods. The number of deaths from tuberculosis in each of the years between 1942 and 1944 was fewer than for the preceding year. According to

[1] From the Tuberculosis Control Division, U. S. Public Health Service, and the Division of Vital Statistics, U. S. Bureau of the Census.

Grateful acknowledgment is made to Richard V. Kasius, Tuberculosis Control Division, U. S. Public Health Service, for his assistance in assembling and analyzing the material used in this paper.

[2] This figure was obtained from the offices of the Surgeons General of the War and Navy Departments. It includes all deaths in combat, deaths from injuries sustained in battle, and missing persons declared dead.

preliminary estimates for 1945, the number of tuberculosis deaths continued to decline.

The reduction in tuberculosis mortality has not been limited to any particular geographic area, but is apparent in the statistics for a great majority of the States. However, there were a few exceptions where the number of deaths in 1944 exceeded the average annual number for the prewar period, 1939–41. Moreover the rate of decline has not been uniform in all geographic areas, the decline for the New England and Middle Atlantic States being relatively small as compared with that for other geographic divisions.

This report presents an analysis of tuberculosis mortality statistics for 1944 for the United States and for each State. Because detailed data by age, race, and sex are not available for individual States, it is difficult to determine the significance of the changes in the crude rates from previous years. In addition, the evaluation of tuberculosis mortality in the United States during the war years has been complicated by the fact that a considerable number of the population has been overseas. Consequently, the statistics are not entirely comparable with those for previous years. For the country as a whole, tuberculosis mortality rates can be made more comparable by the inclusion of statistics for the armed forces overseas. However, for individual States considerable study on a local level is necessary for a more satisfactory evaluation of the data.

Tuberculosis Mortality in the United States

Tuberculosis Mortality in 1944

There were 54,731 deaths from tuberculosis (all forms) recorded in the United States in 1944, a decrease of 4.0 percent from the corresponding number of 57,005 deaths in 1943. This decline may not be as significant as it appears because there was only a small reduction of 1.2 percent in the number of tuberculosis deaths in 1943 as compared with the number in 1942. However, the decline is substantial, even when the comparatively small decrease in 1943 is taken into consideration. The average annual number of deaths for the two years 1943 and 1944 is 3.1 percent fewer than the number in 1942. In 1942 there were 1,561, or 2.6 percent, fewer deaths from tuberculosis than in 1941, and the reduction in the latter year from 1940 amounted to 1,177 deaths, or 1.9 percent. The death rates for tuberculosis per 100,000 population were 41.3 in 1944, 42.6 in 1943, and 43.1 in 1942. The average annual rate for the 3-year period 1939–41 was 45.8 per 100,000 population.

These rates are based on deaths occurring in the United States and on estimates of the population residing within the continental limits of the United States, which exclude members of the armed forces serving outside the country. Beginning with 1943, the number of such

persons became sufficiently large so that their exclusion from the estimated population had a noticeable effect on the death rate for tuberculosis, especially among males of certain age groups.

The procedure of excluding the population overseas and the deaths occurring within this population in computing vital statistics rates may be satisfactory in the evaluation of mortality risks for many causes, especially for acute diseases. However, when applied to tuberculosis, the use of this procedure results in overstating the rates when compared with those for previous years, since it excludes a large population group for which the tuberculosis death rate is relatively low. A detailed discussion of this situation may be found in a previous report.[3]

Because of these changes in composition of the population in the continental United States during recent years, it is not possible now to obtain a measure of the risk of death from tuberculosis in the United States which is comparable with that for previous years. However, it is possible to obtain a more comparable measure by relating the deaths from tuberculosis occurring among all residents of the United States to the total resident population, irrespective of present location.

According to the records of the armed services, there were 164 deaths[4] from tuberculosis which occurred outside of the continental United States in 1944. The addition of these deaths to the 54,731 which occurred in the continental United States represents the total number of recorded tuberculosis deaths among the entire population of the United States, including armed forces overseas. The tuberculosis death rate on a *de jure* basis, or the rate for the entire resident population (including the armed forces overseas) in 1944 was 39.6 per 100,000 population as compared with the rate of 41.3 for the *de facto* population (excluding armed forces overseas). The former rate is more nearly comparable with the tuberculosis death rates for previous years. This *de jure* rate of 39.6 is 5.2 percent lower than the similarly computed *de jure* rate of 41.8 for 1943. The average *de jure* rate for the 3 war years was 41.4 per 100,000 population (including armed forces overseas), or 9.6 percent lower than the corresponding average rate of 45.8 for the prewar period 1939 to 1941, inclusive. This decline is in striking contrast to the experience of the war-torn countries where tuberculosis is reported to have assumed epidemic proportions.

Although tuberculosis death rates based on the total population, including armed forces overseas, are more meaningful for comparative

[3] *Tuberculosis mortality in the United States in 1943*, Vital Statistics-Special Reports, Vol. 21, No. 2, Apr. 10, 1945 (see p. 23–24).

[4] Data furnished by courtesy of the Surgeons General of the War and Navy Departments, respectively, show 150 tuberculosis deaths among Army personnel overseas, 9 deaths among Naval personnel overseas, and 5 deaths among Naval personnel aboard ship.

purposes than rates excluding the deaths and the population overseas, the basic tables given in this report relate only to deaths among the population present in the continental United States. This procedure is followed, since data for the armed forces are not yet available in the same detail as those for residents present in the United States. It is, therefore, not possible to compute comparable rates for all classifications, or for smaller geographic and political subdivisions of the country, such as States and local communities. Except where indicated, the tuberculosis death rates given in this report are based on the *de facto* population (excluding armed forces overseas). However, attention will be called to rates that appear to obscure the probable tuberculosis mortality situation.

Tuberculosis Mortality Trend by Race and Sex: 1910–44

In table 1 and figure 1 are presented the trends of tuberculosis mortality by race and sex during the period 1910 to 1944. Tuberculosis mortality has been declining at a relatively rapid rate through

TABLE 1.—*Death rates for tuberculosis (all forms), by race and sex: death-registration States, 1910–1944*

[Rates per 100,000 population]

Year	Total	White			Nonwhite		
		Total	Male	Female	Total	Male	Female
1944	41.3	33.7	45.0	23.3	106.2	122.7	91.3
1943	42.6	34.3	44.4	24.7	112.9	126.4	100.0
1942	43.1	34.4	43.3	25.6	118.4	131.4	106.0
1941	44.5	35.4	43.3	27.4	124.2	134.3	114.5
1940	45.8	36.5	44.7	28.2	127.6	138.7	116.9
1939	47.1	37.7	44.7	30.6	129.1	137.3	121.1
1938	49.1	39.1	46.2	31.9	136.8	144.0	129.8
1937	53.8	43.4	50.9	35.8	145.0	155.0	135.2
1936	55.9	45.0	52.2	37.6	151.6	163.9	139.6
1935	55.1	44.9	51.7	37.8	145.1	155.4	135.0
1934	56.7	46.2	52.7	39.6	148.8	156.9	140.8
1933	59.6	48.5	54.3	42.6	157.7	165.6	149.9
1932	62.5	50.2	55.9	44.4	173.5	179.5	167.5
1931	67.8	54.2	60.1	48.2	191.1	197.4	184.9
1930	71.1	57.7	63.4	51.9	192.0	194.3	189.8
1929	75.3	62.4	67.1	57.6	192.0	191.5	192.6
1928	78.3	64.9	69.7	59.9	199.5	199.4	199.6
1927	79.6	66.5	70.7	62.2	208.7	205.4	212.1
1926	85.5	72.0	76.4	67.5	223.8	221.5	226.1
1925	84.8	71.6	75.8	67.2	221.3	215.8	226.7
1924	87.9	74.9	79.3	70.4	218.6	215.0	222.3
1923	91.7	79.5	84.4	74.5	213.1	206.3	220.0
1922	95.3	82.6	87.5	77.4	218.9	216.6	221.2
1921	97.6	84.7	89.1	80.2	239.3	233.7	245.1
1920	113.1	99.5	104.1	94.8	262.4	255.4	269.6
1919	125.6	110.9	121.1	100.4	284.0	275.5	292.7
1918	149.8	134.3	153.2	115.4	346.0	351.0	340.9
1917	143.5	129.6	------	------	332.6	------	------
1916	138.4	125.7	141.3	109.5	322.7	322.3	323.0
1915	140.1	128.5	144.0	112.2	401.1	420.2	380.5
1914	141.7	130.3	146.9	112.9	396.7	417.8	374.0
1913	143.5	132.6	147.7	116.7	386.5	401.9	369.9
1912	145.4	136.0	149.4	121.8	429.0	459.9	394.5
1911	155.1	145.0	157.5	131.9	461.4	484.8	435.2
1910	153.8	145.9	158.2	132.8	445.5	479.3	406.8

this entire period, although the decline has been generally greater for females than for males, and for whites than for nonwhites.

In general, the rates were highest during the 35-year period for nonwhite males and lowest for white females. However, there was a period of 10 years between 1919 and 1928 when the rate for nonwhite females was the highest. Since 1929, the rate for nonwhite females has remained lower than that for nonwhite males, and the difference between the rates for the two sexes has been increasing. The rate of decline in tuberculosis mortality among nonwhite males since 1923 has been lower than that for the preceding 13-year period.

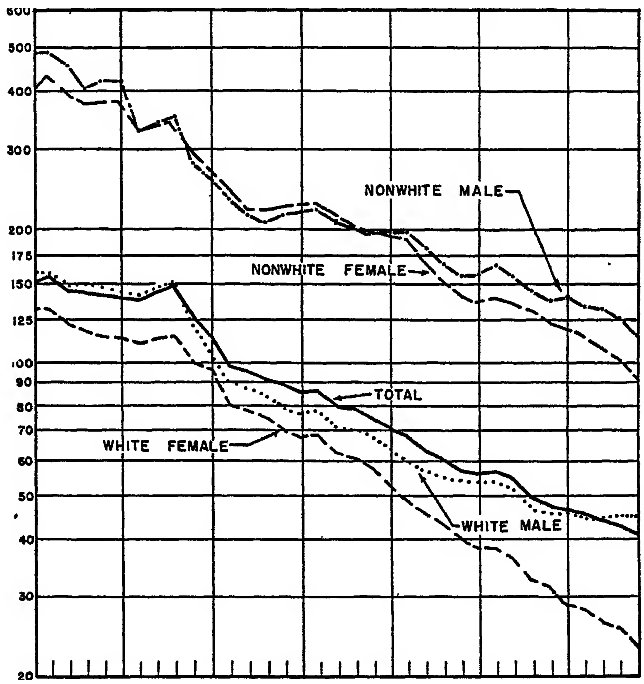

FIGURE 1.—Trend of death rates per 100,000 population for tuberculosis (all forms) by race and sex: Death registration States, 1910–44.

The tuberculosis death rate for white females has been declining almost continuously since 1918. The rate for white females in 1944 was about one-fifth of that in 1918. The rate of decline in tuberculosis mortality among white males has been smaller than that for white females, and beginning with 1938, the rate has almost levelled off. The tuberculosis death rates for white males in 1943 and 1944 actually indicate increases over the rates for the preceding year. However, part of these increases are only apparent and result from the exclusion of a relatively large number of men of military age serving overseas. Data are not available by race and sex, but the

death rates for males of all races based on data which includes the armed forces show an actual decrease from 50.9 in 1943 to 49.0 per 100,000 population in 1944. These rates may be contrasted with the corresponding *de facto* rates of 52.9 in 1943 and 53.1 per 100,000 population (excluding armed forces overseas) in 1944.

The average annual tuberculosis death rate for all males including the armed forces overseas for the war years, 1942–44, was 50.6 per 100,000 population as compared with the average rate of 53.5 for the prewar years, 1939–41. This decline of 5.4 percent in the average rate for males was considerably less than that of 15.3 percent for females. The rate for females decreased from 38.0 for the 3-year period, 1939–41, to 32.2 for the 3 war years.

One of the more striking changes in tuberculosis mortality is the relatively large decrease in the number of deaths among nonwhites in recent years. There were 2,274 fewer tuberculosis deaths in 1944 than in 1943. Of this number, nonwhites accounted for 1,023 and whites for 1,251. On a percentage basis these figures represent a decline of 6.5 percent in the number of tuberculosis deaths for nonwhites, and 3.0 percent in the number for whites.

Age-Specific Death Rates by Race and Sex

As mentioned before, the exclusion of statistics on the overseas population leads to an overstatement of the death rates for tuberculosis. This is especially true of the rate for males of military age. For example, the *de facto* rates for males age 20 to 29 in 1944 was 53.7. However, the *de jure* rate which more nearly approximates the true rate is 37.2 [5] per 100,000 population (including armed forces overseas). Since the use of *de facto* data affects only the rates for males in a relatively narrow age range, the general configuration of the curves is not changed. However, caution should be exercised when comparisons are made with similar data for previous years in which rates for males of military age are involved.

The general form of the curves of tuberculosis mortality by age, race and sex (fig. 2 and table 2) for 1944 is much like that for previous years. In practically every age group the rate for nonwhites is much higher than that for whites. The rates for males, especially among whites, increase continuously with age (except for the very young) while those for females reach a peak early in adult life. The peak in mortality for nonwhite females is much higher than that for white females, and occurs between ages 20 and 24 years, while the corresponding one for white females occurs later, in the 30–34 year age group.

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[5] All of the 164 deaths from tuberculosis occurring overseas were assumed to have occurred in this age group.

During the period of adolescence and young adulthood, the rates are higher for females than for males. In the older age groups, the rates for males are much higher than the corresponding rates for females.[6]

Figure 3 presents a comparison of tuberculosis mortality by age and sex for the war and prewar years. Data for 1942–44 are on a *de jure* basis (including armed forces overseas). It may be seen that there has been a decline in the rate for every group except for males 65

TABLE 2.—*Death rates and number of deaths for tuberculosis (all forms), by age, race, and sex: United States, 1939–41 average, 1942, 1943, and 1944*

Race, sex, and year	All ages [1]	Age (in years): Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–44	45–54	55–64	65–74	75 and over
	Tuberculosis deaths per 100,000 population												
All races, both sexes:													
1944	41.3	12.3	3.1	4.6	22.1	48.4	50.3	48.6	51.6	59.9	69.4	77.2	72.8
1943	42.6	12.2	3.6	5.6	24.4	45.8	49.0	51.3	52.8	63.6	72.3	79.2	73.6
1942	43.1	14.0	3.9	6.1	24.5	46.3	50.6	52.1	54.9	63.8	70.3	77.5	74.1
1939–41	45.8	15.2	4.4	6.8	27.5	49.2	56.1	56.5	59.0	66.6	74.5	80.4	76.7
Male:													
1944	53.1	12.7	3.0	3.6	17.4	50.6	56.8	53.7	67.9	91.6	105.4	106.6	92.9
1943	52.9	12.6	3.7	4.4	19.5	42.0	48.9	55.7	68.6	95.4	107.5	108.1	90.8
1942	52.3	14.4	4.1	4.9	18.7	39.0	48.2	57.9	71.0	94.3	102.9	103.8	88.6
1939–41	53.5	15.5	4.6	5.2	20.0	40.4	51.0	59.8	74.1	95.8	105.8	105.0	88.6
Female:													
1944	30.5	11.8	3.2	5.6	26.4	47.0	46.0	44.2	36.3	27.9	32.2	49.0	55.4
1943	32.6	11.8	3.4	6.9	29.3	48.9	49.0	47.3	37.7	31.2	35.8	51.5	58.7
1942	34.0	13.6	3.7	7.5	30.4	53.1	52.8	46.7	39.2	32.4	36.4	51.9	61.5
1939–41	38.0	15.0	4.3	8.5	35.0	57.8	61.0	53.4	43.9	35.9	41.6	56.2	66.3
White, both sexes:													
1944	33.7	9.0	2.0	2.4	11.9	29.9	34.7	35.8	40.8	51.8	64.7	74.3	72.1
1943	34.3	9.0	2.4	2.9	12.6	27.8	34.1	37.5	41.8	54.8	66.6	75.6	73.4
1942	34.4	10.7	2.5	3.2	13.1	27.9	34.3	37.5	43.0	54.9	64.9	74.4	73.3
1939–41	36.5	10.9	2.8	3.6	14.8	30.7	38.6	41.4	46.1	57.4	69.3	77.4	76.2
Male:													
1944	45.0	9.1	2.0	1.9	9.0	31.3	39.4	39.1	54.3	80.2	99.3	103.1	90.8
1943	44.4	9.3	2.6	2.4	9.8	25.4	33.7	40.3	55.1	83.8	100.3	103.4	88.5
1942	43.3	10.6	2.7	2.7	10.3	22.9	31.8	41.4	56.5	82.7	96.0	99.3	86.0
1939–41	44.2	11.0	3.0	2.9	10.7	24.2	34.5	43.6	58.7	84.0	99.8	100.7	86.6
Female:													
1944	23.3	8.8	1.9	2.8	14.6	28.9	31.6	32.8	28.0	23.1	29.1	47.0	56.0
1943	24.7	8.7	2.3	3.4	15.4	29.7	34.4	35.0	28.9	25.1	31.9	49.0	60.2
1942	25.6	10.7	2.3	3.6	15.9	32.6	36.6	33.7	29.7	26.2	32.7	50.4	62.1
1939–41	28.7	10.9	2.7	4.3	18.9	37.0	42.5	39.3	33.5	29.3	37.6	54.7	67.1
Nonwhite, both sexes:													
1944	106.2	35.9	10.0	20.4	97.9	188.9	174.5	156.1	147.0	145.4	130.2	118.4	81.4
1943	112.9	35.1	10.9	25.0	114.4	184.7	168.5	168.0	149.7	157.5	144.4	131.9	76.7
1942	118.4	37.6	13.2	27.6	113.1	194.9	185.3	180.5	159.2	160.5	139.2	122.0	85.8
1939–41	127.1	45.5	15.4	30.7	129.1	203.0	201.5	191.0	171.8	167.8	139.0	123.4	83.6
Male:													
1944	122.7	38.5	8.9	15.5	80.2	188.1	195.9	180.2	191.5	212.3	181.1	154.2	120.8
1943	126.4	36.9	11.4	18.9	94.0	166.1	173.2	189.2	190.6	219.0	195.1	171.0	121.0
1942	131.4	41.7	13.5	20.5	84.6	172.5	190.3	206.4	201.9	220.6	187.0	165.1	123.7
1939–41	137.0	47.4	16.2	22.2	96.8	183.6	195.3	208.5	213.2	225.0	178.2	164.7	116.2
Female:													
1944	91.3	33.2	11.0	25.3	114.3	189.5	160.2	136.6	107.5	78.6	74.1	79.9	47.9
1943	100.0	33.3	10.4	31.1	134.1	200.6	164.7	149.5	112.4	95.1	88.0	89.9	38.8
1942	106.0	33.6	12.9	34.6	140.7	214.5	181.1	157.2	119.8	98.8	85.9	75.6	53.2
1939–41	117.5	43.5	14.6	39.1	159.7	219.8	207.0	174.9	132.7	107.5	94.7	78.6	55.0

See footnote at end of table.

[6] In 1939–41, the death rate curve for males crossed that for females at age 30 years for whites, at about 29 years for nonwhites. In figure 2 the corresponding ages may be seen to be somewhat earlier. However, this apparent shift is the result of the overstatement of the death rates for males in the age group 20–29 years as discussed above. When rates on a *de jure* basis are used, the relative position of the curves for 1944 becomes much like that for 1939–41.

TABLE 2.—*Death rates and number of deaths for tuberculosis (all forms), by age, race, and sex: United States, 1939–41 average, 1942, 1943, and 1944*—Con.

Race, sex, and year	All ages [1]	Age (in years)											
		Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–44	45–54	55–64	65–74	75 and over
	Number of deaths from tuberculosis												
All races, both sexes:													
1944	54, 731	1, 550	342	496	2, 498	4, 831	4, 884	4, 995	9, 734	9, 707	8, 174	5, 316	2, 161
1943	57, 005	1, 477	389	617	2, 894	5, 048	5, 215	5, 344	9, 938	10, 223	8, 306	5, 359	2, 131
1942	57, 690	1, 590	420	692	2, 967	5, 347	5, 595	5, 461	10, 267	10, 175	7, 884	5, 139	2, 091
1939–41	60, 429	1, 613	475	799	3, 388	5, 719	6, 236	5, 811	10, 846	10, 373	7, 960	5, 104	2, 052
Male:													
1944	33, 717	816	168	197	949	1, 960	2, 212	2, 548	6, 207	7, 455	6, 308	3, 591	1, 279
1943	34, 786	776	206	244	1, 147	2, 073	2, 380	2, 763	6, 325	7, 744	6, 286	3. 584	1, 221
1942	34, 801	831	223	278	1, 132	2, 150	2, 557	2, 954	6, 564	7, 635	5, 884	3, 390	1, 164
1939–41	35, 433	831	251	306	1, 234	2, 306	2, 782	3, 038	6, 803	7, 650	5, 786	3, 308	1, 109
Female:													
1944	21, 014	734	174	299	1, 549	2, 871	2, 672	2, 447	3, 527	2, 252	1, 866	1, 725	882
1943	22, 219	701	183	373	1, 747	2, 975	2, 835	2, 581	3, 613	2, 479	2, 020	1, 775	910
1942	22, 889	759	197	414	1, 835	3, 197	3, 038	2, 507	3, 703	2, 540	2, 000	1, 749	927
1939–41	24, 996	782	224	493	2, 154	3, 413	3. 454	2, 773	4, 043	2, 723	2, 174	1, 796	943
White, both sexes:													
1944	39, 958	995	193	221	1, 185	2, 632	2, 996	3, 287	6, 909	7, 666	7, 066	4, 785	1, 991
1943	41, 209	955	231	277	1, 318	2, 707	3, 231	3, 499	7, 050	8, 052	7, 101	4, 778	1, 977
1942	41, 306	1, 056	234	314	1, 403	2, 869	3, 381	3, 522	7, 213	8, 004	6, 745	4, 613	1, 926
1939–41	43, 282	1, 014	265	372	1, 617	3, 180	3, 828	3, 827	7, 605	8, 183	6, 865	4, 596	1, 904
Male:													
1944	25, 596	518	101	93	431	1, 065	1, 364	1, 665	4, 476	5, 966	5, 500	3, 233	1, 163
1943	26, 162	502	123	116	509	1, 104	1, 462	1, 795	4, 570	6, 224	5, 429	3, 194	1, 109
1942	25, 899	536	128	138	556	1, 127	1, 512	1, 906	4, 704	6, 123	5, 077	3, 021	1, 054
1939–41	26, 350	520	141	152	589	1, 239	1, 690	2, 000	4, 848	6, 143	5, 042	2, 955	1, 013
Female:													
1944	14, 362	477	92	128	754	1, 567	1, 632	1, 622	2, 433	1, 700	1, 566	1, 552	828
1943	15, 047	453	108	161	809	1, 603	1, 769	1, 704	2, 480	1, 828	1, 672	1, 584	868
1942	15, 407	520	106	176	847	1, 742	1, 869	1, 616	2, 509	1, 881	1, 668	1, 592	872
1939–41	16, 932	494	124	220	1, 028	1, 941	2, 138	1, 827	2, 757	2, 040	1, 823	1, 641	891
Nonwhite, both sexes:													
1944	14, 773	555	149	275	1, 313	2, 199	1. 888	1, 708	2, 825	2, 041	1, 108	531	170
1943	15, 796	522	158	340	1, 576	2, 341	1, 984	1, 845	2, 888	2, 171	1, 205	581	154
1942	16, 384	534	186	378	1, 564	2, 478	2, 214	1, 939	3, 054	2, 171	1, 139	526	165
1939–41	17, 147	599	210	427	1, 771	2, 539	2, 408	1, 984	3, 241	2, 190	1, 095	508	148
Male:													
1944	8, 121	298	67	104	518	895	848	883	1, 731	1, 489	808	358	116
1943	8, 624	274	83	128	638	909	918	968	1, 755	1, 520	857	390	112
1942	8, 902	295	95	140	576	1, 023	1, 045	1, 048	1, 860	1, 512	807	369	110
1939–41	9, 083	311	110	154	645	1, 067	1, 092	1, 038	1, 955	1, 507	744	353	96
Female:													
1944	6, 652	257	82	171	795	1, 304	1, 040	825	1, 094	552	300	173	54
1943	7, 172	248	75	212	938	1, 372	1, 066	877	1, 133	651	348	191	42
1942	7, 482	239	91	238	988	1, 455	1, 169	891	1, 194	659	332	157	55
1939–41	8, 064	288	100	273	1, 126	1, 472	1, 316	946	1, 286	683	351	155	52

[1] Includes ages not stated.

years and over. This increase appears significant in view of the decline in the tuberculosis death rate for males in the age group 65 years and over for a long-time period prior to the war. In the younger ages, the *absolute* decrease in the death rates for males in the age groups between 5 and 14 years and between 20 and 45 years appears to be more marked than in the other ages. On a relative basis, there was a decrease of 10 percent or more in the death rate for every group between 5 and 34 years. The greatest decline of 21.7 percent occurred in the rate for males 10 to 14 years of age.

The decline in tuberculosis mortality among females during the two periods, 1939 to 1941 and 1942 to 1944, was considerably greater than for males. There was a decrease in the death rate for every

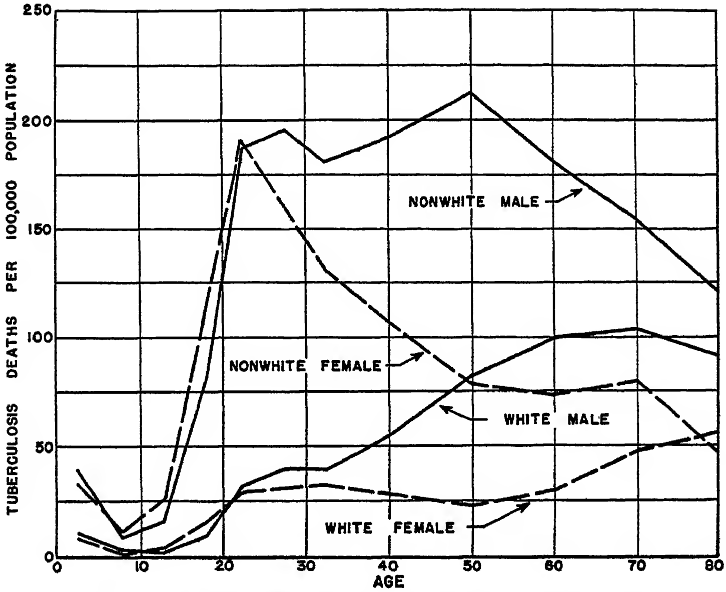

FIGURE 2.—*De facto* death rates per 100,000 population (excluding armed forces overseas) for tuberculosis (all forms) by age, race, and sex: United States, 1944.

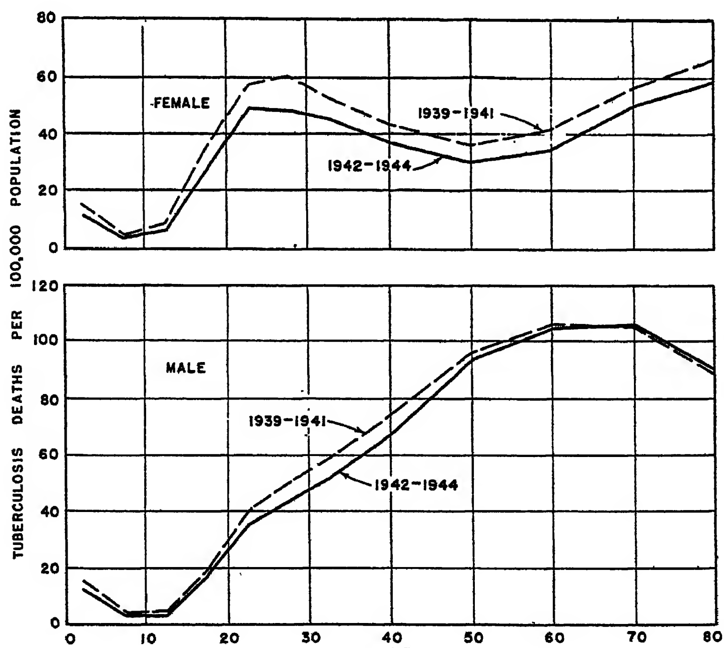

FIGURE 3.—*De jure* death rates per 100,000 population (including armed forces overseas) for tuberculosis (all forms) by age and sex: United States, 1939-41 and 1942-44 averages.

group, the greatest decline occurring in the case of males in the 10–14 year age group (21.2 percent). The decrease in the rate for every age group, except one, was greater than 10 percent. The smallest change in the death rate was 9.6 percent and occurred in the rate of females 65 to 74 years.

It is also significant that there has been a change in the age at which the first peak in mortality for females occurs. In the prewar period, 1939–41, the peak in the mortality curve came within the 25–29 year age range. As a result of the large reduction in the rate for this group, the peak in the rate appears earlier (20–24 year age group) during 1942–44.

Proportionate Mortality by Age, Race, and Sex

Figure 4 shows the proportionate mortality, or the number of deaths from tuberculosis out of every 100 deaths from all causes, for 1944, by age for the four race-sex groups. These ratios do not measure the risk of death from tuberculosis but indicate the relative importance of tuberculosis as a cause of death. Since both the numerator and denominator of the ratios are affected approximately to the

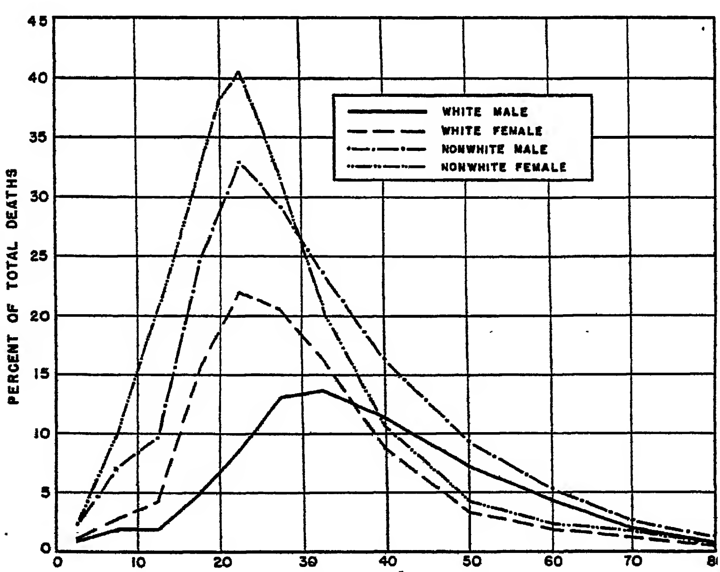

FIGURE 4.—Deaths from tuberculosis (all forms) as percentages of deaths from all causes, by age, race, and sex: United States, 1944.

same degree by the exclusion of statistics for the armed forces overseas, the proportionate mortality from tuberculosis is affected to a much less extent by the removal of men for overseas duty than are *de facto*

death rates. In the absence of *de jure* rates, these ratios may be used to supplement the *de facto* rates in determining the extent and direction of changes in tuberculosis mortality relative to total mortality.

The shapes of the proportionate mortality curves given in figure 4 for 1944 are very similar to those for previous years. The peaks in each curve and the points at which the curves cross each other occur almost exactly at the same age groups as in previous years. These curves differ in shape from the death rate curves given in figure 3 in that the peaks occur earlier for each race-sex group.

It may be seen from figure 4 that tuberculosis represents a mortality problem of considerable magnitude among young adults. For example, over 40 percent of all deaths among nonwhite females 20 to 24 years of age occurring in 1944 were attributed to tuberculosis; 33 percent of the total deaths among nonwhite males between 20 and 24 years were recorded as tuberculosis deaths; 22 percent of the deaths from all causes reported for white females 20 to 24 years were from tuberculosis; and tuberculosis deaths represented 14 percent of all deaths of white males 30 to 34 years.

Distribution of Tuberculosis Deaths by Age

For purposes of control activities, it is useful to know the age groups in which the tuberculosis deaths are concentrated. Although the death rate for tuberculosis increases with age, as shown in figure 2, it does not follow that the number of tuberculosis deaths is more numerous in the older ages because there are fewer people in these ages. Actually, the number of tuberculosis deaths is greatest in the 20–44 year age group where 44.7 percent of all tuberculosis deaths occurred. As may also be seen from table 3, nearly one-third of all deaths from tuberculosis occurred among persons between the ages of 45 and 64 years.

TABLE 3.—*Percent distribution of tuberculosis deaths, by age and sex: United States, 1944*

Age groups	Total	Male	Female
All ages [1]	100.0	61.6	38.4
Under 20 years	8.9	3.9	5.0
20–44 years	44.7	23.6	21.0
45–64 years	32.7	25.1	7.5
65 years and over	13.7	8.9	4.8

[1] Includes ages not stated.

The age distribution of tuberculosis deaths is different for males than for females. Among males there were nearly as many deaths in the 20–44 year age group as in the age group 45 to 64 years, while there were about three times as many tuberculosis deaths among

females aged 20 to 44 years as there were in the age group 45 to 64 years.

Because of the aging of the population and also because the tuberculosis death rate has been declining faster for the younger than for the older age groups in the population, there has been a consistent change in the percent distribution of tuberculosis deaths. As may be seen from figure 5, the deaths in the youngest age group (under 20 years) represented 16.9 percent of all tuberculosis deaths in 1919–21; 14.4 percent in 1929–31; 10.4 percent in 1939–41; 9.6 percent in 1942–43; and 8.9 percent in 1944. Similarly, for the age group 20 to 44

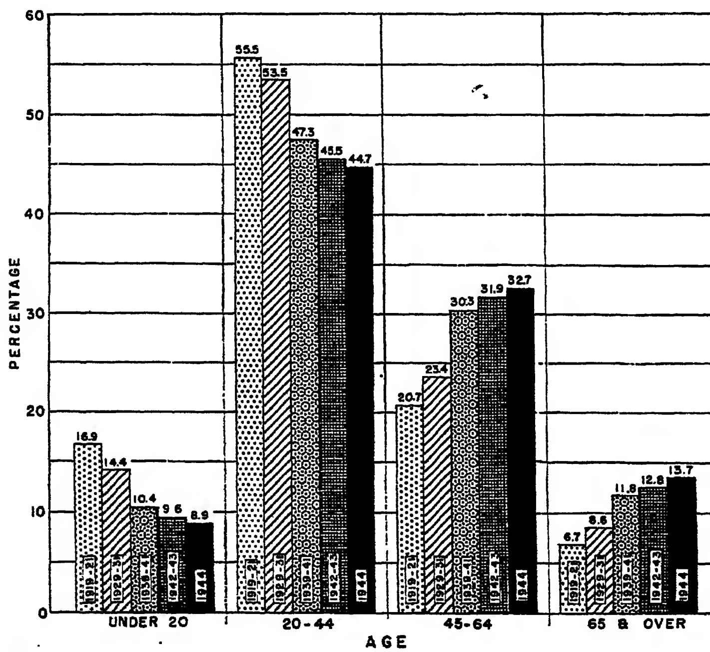

FIGURE 5.—Percent distribution of deaths from tuberculosis (all forms) by age: United States, 1919–21, 1929–31, 1939–41, 1942–43 averages, and 1944.

years, the percentage dropped from 55.6 percent in 1919–21 to 44.7 percent in 1944. On the other hand, the percentage of tuberculosis deaths for the age group 45 to 64 years has been increasing. In the age group 65 years and over, the percentage has been doubled within the last two decades.

Tuberculosis Mortality Among War Veterans

Tuberculosis ranks high as a problem in the medical care of war veterans. This problem was fully recognized in the years following the first world war, and special facilities were provided for the care of veterans with tuberculosis.

In order to minimize the tuberculosis problem among veterans of World War II, the Selective Service System and the armed forces utilized the recent developments in photofluorography for screening out the frank and potential tuberculous cases from the services. In view of this screening process and because of the decline in the tuberculosis rate, it may be anticipated that the tuberculosis rate among World War II veterans will be much lower than that for the veterans of World War I. However, in terms of the large number of veterans involved, tuberculosis will no doubt continue to be a problem of considerable magnitude.

Since the beginning of World War II, there have already been over 17,000 separations from the armed forces because of tuberculosis. During the period December 7, 1941, to December 31, 1944, there were 10,863 separations from the Army due to tuberculosis. In almost the same period (1942–44, inclusive) there were 5,898 separations from service in the Navy for the same cause.

In 1944 there was a total of 981 tuberculosis deaths among veterans of World War II occurring in the United States. Deaths among veterans of World War II amount, at the present time, to slightly less than one-third of the number of tuberculosis deaths among World War II veterans, of which there were 3,009. The total number of tuberculosis deaths among veterans of all wars in 1944 was 4,370.

As may be seen from table 4, the great majority of the 1944 deaths among veterans occurred in institutions, and of these the majority were in Federal institutions, primarily in hospitals of the Veterans Administration and in station and shore hospitals of the Army and Navy.

TABLE 4.—*Number of deaths from tuberculosis (all forms) among war veterans in institutions by type of control: United States, 1944*

Type of control	Total	World War I	World War II	World Wars I and II	Other wars
Total	4,370	3,009	974	7	380
Deaths not in institutions	608	456	105	0	47
Deaths in institutions	3,762	2,553	869	7	333
Type of control:					
Federal	2,889	1,858	757	5	269
State	146	100	24	0	22
City and county	491	411	49	0	31
Nonprofit	193	151	30	2	10
Proprietary and unknown	43	33	9	0	1

The proportion of tuberculosis deaths occurring in institutions in 1944 was much higher among veterans (86.1) than among the general population (64.0). It was slightly higher for World War II veterans (89.3 percent) than among veterans of World War I (84.8).

Tuberculosis Mortality by States

The tuberculosis death rate for individual States varies over a wide range. The lowest rate in 1944 was 12.0 per 100,000 population reported for residents of the State of Utah. The highest rate, more than 10 times that of the lowest, was 122.9 for Arizona. The rates for these two States, Utah and Arizona, were also the lowest and highest, respectively, in 1943. One-fourth of the States had rates of less than 32; one-half of them recorded rates of less than 38.3 and the rates in the top one-fourth of the States was 45 per 100,000 population or higher.

The geographic distribution of the tuberculosis death rate in 1944 was much like that of previous years. In general, two large bands of low and high tuberculosis mortality may be noted in figure 6. The

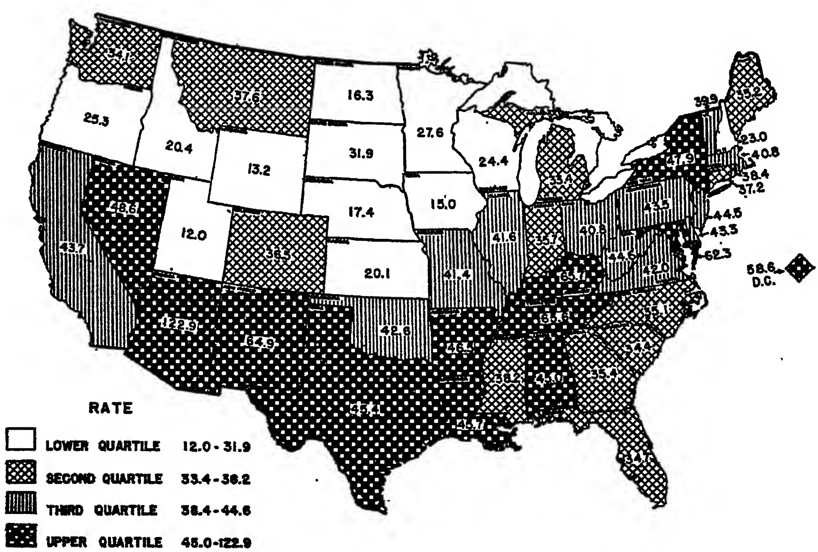

FIGURE 6.—Death rates per 100,000 population for tuberculosis (all forms): Each State, 1944.

area of relatively low mortality extends from the Pacific Northwest to Wisconsin. New Hampshire is the only other State falling in the lower quartile. The area of relatively high tuberculosis mortality stretches across the southern part of the United States from Nevada to Kentucky. The other States in the upper quartile are Maryland and New York. (The District of Columbia was also in the upper quartile.)

The geographic differences in tuberculosis mortality are not all easily explainable. Not all of the variations in these rates reflect real differences in the force of tuberculosis mortality as influenced by environmental and other conditions, by efforts exerted in the control

of the disease, and by facilities available for the care of the tuberculous. Part of the differences in the rates may only be apparent and result from variations in the accuracy of diagnosis and completeness with which tuberculosis deaths are reported. In addition, the crude death rate is greatly affected by the age, race, and sex composition of the population. Data on population composition required for a more satisfactory evaluation of these differences are not available for 1944. Ordinary methods of estimating the population according to these factors are not valid for the war years in view of the unprecedented population movement and the complication arising from the fact that a relatively large proportion of the population of the different States was serving in the armed forces overseas and in other parts of the country.

Comparison of Tuberculosis Mortality in 1944 With Previous Years

Table 5 presents the number of deaths from tuberculosis for each State in each of the 3 war years, 1942, 1943, and 1944, the average annual number of deaths for the prewar period, 1939–41 and the death rates per 100,000 population for the same periods. In addition, there are presented percent changes in the rates from 1943 to 1944, from 1939–41 to 1944, as well as from the average annual prewar rate to the average annual rate for the 3 war years, 1942–44.

It may be seen that the decrease in the rate in 1944, compared with 1943, has been rather general and occurred in a large number of States. In 31 States and in the District of Columbia, the rate for 1944 was lower than for 1943; in 16 there has been an increase in the rate; and in one the rates for the two years were the same. In evaluating the percent changes in the rates, it is important to bear in mind that crude rates are affected by changes in the age-race-sex composition of the population, but these changes are not reflected by the estimated populations on which the rates are based. For example, the populations of States containing large numbers of military camps will be augmented by a selected group of healthy males in an age group for which the mortality is relatively low. Moreover, yearly fluctuations in the rates for States may, in some cases, be insignificant, and in others, they may be dependent on large changes in the rate which may have occurred in previous years. In other words, a small increase following a stationary or rising rate may be more significant than a much larger increase which is preceded by a relatively large decrease in the rate.

It may be well to consider in addition, the differences in the actual number of deaths over a period of years. There were 10 States that recorded more deaths in 1944 than the average number for the period 1939–41. In 1944 there were 784 deaths recorded for residents of Arizona, as compared with an average annual number of 724 deaths

for the period 1939–41. Connecticut reported 661 deaths in 1944 and an average annual number of 616 in 1939–41. The corresponding figures for Rhode Island were 300 and 265. Other States with more deaths in 1944 than the average annual number in 1939–41 were

TABLE 5.—*Number of deaths from tuberculosis (all forms), death rates and percent changes in rates, by State: United States, 1939–41 average, 1942, 1943, and 1944*

[By place of residence]

Area	Number of deaths				Rate per 100,000 population				Percent change in rates		
	1944	1943	1942	1939–41 average	1944	1943	1942	1939–41 average	1943 to 1944	1939–41 to 1944	1939–41 to 1942–44
United States	54,731	57,005	57,690	60,429	41.3	42.6	43.1	45.8	−3.1	−9.8	−7.6
Alabama	1,269	1,302	1,285	1,518	45.0	45.0	43.7	53.4	0	−15.7	−16.5
Arizona	784	690	675	724	122.9	98.2	122.7	144.3	+25.2	−14.8	−21.3
Arkansas	826	939	1,029	1,009	46.5	50.2	52.0	51.7	−7.4	−10.1	−3.9
California	3,826	3,872	3,876	3,838	43.7	45.7	50.5	55.1	−4.4	−20.7	−15.6
Colorado	419	471	495	503	36.5	40.5	44.6	44.7	−9.9	−18.3	−9.4
Connecticut	661	621	633	616	37.2	34.9	35.5	35.9	+6.6	+3.6	0
Delaware	123	111	146	152	43.3	39.5	52.3	56.9	+9.6	−23.9	−20.9
District of Columbia	547	533	551	548	58.6	59.9	63.7	80.0	−2.2	−26.8	−24.1
Florida	823	855	870	944	34.7	36.1	40.7	49.4	−3.9	−29.8	−24.9
Georgia	1,141	1,332	1,295	1,510	35.4	41.3	40.2	48.2	−14.3	−26.6	−19.1
Idaho	109	93	86	99	20.4	18.7	18.0	18.8	+9.1	+8.5	+1.6
Illinois	3,218	3,349	3,338	3,663	41.6	43.5	41.6	46.3	−4.4	−10.2	−8.6
Indiana	1,221	1,248	1,281	1,398	35.7	36.7	36.7	40.7	−2.7	−12.3	−10.6
Iowa	341	395	427	450	15.0	17.0	17.6	17.7	−11.8	−15.3	−6.2
Kansas	357	345	438	423	20.1	19.4	25.0	23.6	+3.6	−14.8	−8.9
Kentucky	1,726	1,785	1,841	1,961	65.7	65.3	66.0	68.7	+.6	−4.4	−4.5
Louisiana	1,158	1,290	1,211	1,347	45.7	50.5	47.5	56.8	−9.5	−19.5	−15.7
Maine	279	275	258	268	35.2	33.6	31.2	31.7	+4.8	+11.0	+5.0
Maryland	1,326	1,277	1,311	1,268	62.3	61.0	65.7	69.4	+2.1	−10.2	−9.2
Massachusetts	1,698	1,819	1,630	1,623	40.8	42.7	37.5	37.6	−4.4	+8.5	+7.2
Michigan	1,814	1,869	1,891	1,828	33.4	34.5	34.2	34.7	−3.2	−3.7	−2.0
Minnesota	693	719	693	758	27.6	27.9	26.0	27.1	−1.1	+1.8	+.4
Mississippi	831	912	1,113	1,074	38.2	40.9	50.0	49.0	−6.6	−22.0	−12.2
Missouri	1,487	1,659	1,574	1,783	41.4	44.2	41.4	47.1	−6.3	−12.1	−10.0
Montana	175	206	201	235	37.6	42.5	39.0	42.0	−11.5	−10.5	−5.5
Nebraska	211	208	180	225	17.4	16.9	14.5	17.1	+3.0	+1.8	−4.7
Nevada	76	89	80	70	48.6	62.1	58.9	63.7	−21.7	−23.7	−11.8
New Hampshire	105	136	102	133	23.0	29.5	21.1	27.0	−22.0	−14.8	−9.3
New Jersey	1,856	1,932	1,882	1,852	44.5	45.6	44.0	44.4	−2.4	+.2	+.7
New Mexico	345	353	303	357	64.9	66.1	57.3	66.8	−1.8	−2.8	−6.1
New York	6,055	6,335	6,073	6,244	47.9	49.3	46.8	46.3	−2.8	+3.5	+3.7
North Carolina	1,239	1,366	1,461	1,598	35.1	37.5	41.0	44.6	−6.4	−21.3	−15.0
North Dakota	86	123	121	127	16.3	22.7	20.7	19.8	−28.2	−17.7	+.5
Ohio	2,787	2,793	2,846	2,913	40.8	40.6	41.0	42.1	+.5	−3.1	−3.1
Oklahoma	880	932	982	1,104	42.6	43.0	44.4	47.3	−.9	−9.9	−8.5
Oregon	307	271	299	307	25.3	21.9	27.3	28.1	+15.5	−10.0	−12.1
Pennsylvania	4,020	4,080	4,187	4,231	43.5	43.1	43.0	42.7	+.9	+1.9	+1.2
Rhode Island	300	296	280	265	38.4	39.4	37.8	37.1	−2.5	+3.5	+4.0
South Carolina	660	689	805	876	34.4	35.3	39.9	45.9	−2.5	−25.1	−2.6
South Dakota	178	176	185	197	31.9	30.5	31.6	30.7	+4.6	+3.9	+2.0
Tennessee	1,881	1,980	2,082	2,298	65.6	66.9	70.8	78.6	−1.9	−16.5	−13.7
Texas	3,126	3,338	3,611	3,814	45.4	47.9	53.9	59.4	−5.2	−23.6	−17.5
Utah	73	71	82	86	12.0	11.2	14.2	15.5	+7.1	−22.6	−20.0
Vermont	124	119	112	144	39.9	36.3	32.8	40.1	+9.9	−.5	−9.7
Virginia	1,344	1,449	1,632	1,628	42.0	47.1	54.0	60.5	−10.8	−30.6	−21.3
Washington	702	720	676	689	34.1	35.4	35.8	39.6	−3.7	−13.9	−11.4
West Virginia	764	769	785	880	44.6	43.8	41.6	46.1	+1.8	−3.3	−6.1
Wisconsin	726	776	759	806	24.4	25.8	24.3	25.6	−5.4	−4.7	−3.1
Wyoming	34	37	37	45	13.2	14.5	14.7	18.0	−9.0	−26.7	−21.1

Idaho, Maine, Maryland, Massachusetts, Nevada, New Jersey, and Washington.

It is difficult to evaluate the changes in the tuberculosis death rate for individual States from data available on a national level. Knowledge of local conditions oftentimes will assist in a better understanding of the changes that may be taking place in tuberculosis mortality. However, certain information is available also on a national level, which may be of some value in interpretation. This additional information consists of the deaths from all causes which occurred among residents of different States. By correlating deaths from tuberculosis to the total number of deaths from all causes, it is possible to supplement the information obtained from a study of the death rates and to determine whether the changes in tuberculosis mortality have differed from those of total mortality. Although the presentation of the complete analysis for all States on this basis is beyond the scope of this paper, it is thought desirable to illustrate this method for the two States which showed the largest percentage change from 1943 to 1944 with the hope that they may serve as a guide for the analysis of data for other States. The States are Arizona, in which there was the largest increase (25.2 percent) in the rate from 1943 to 1944, and North Dakota, which recorded the largest decrease (28.2 percent) in the rate.

Tuberculosis was the cause of 784 deaths in Arizona during 1944, an increase of 94, or 13.6 percent, over that in 1943. During the same period there was also an increase of 4.7 percent in the number of deaths from all causes. Since the percentage increase in the number of tuberculosis deaths has been greater than that for all causes, it would appear that facts other than possible numerical increases in the population have contributed to the increase in tuberculosis mortality. In order to determine whether this increase has resulted from a change in the race-sex composition of the population, it is helpful to review the distribution of total deaths according to race and sex. It may be seen from table 6 that there has been an increase in the proportion of nonwhite deaths from 19 percent in 1943 to 21 in 1944. This increase for nonwhites was accompanied by a decrease

TABLE 6.—*Percent distribution of deaths from all causes by race and sex groups: Arizona, 1944 and 1943*

Race and sex groups	Percent distribution of deaths from all causes	
	1944	1943
Total	100.0	100.0
White male	51.9	51.9
White female	27.0	29.1
Nonwhite male	12.0	10.9
Nonwhite female	9.1	8.1

among white females. Since the tuberculosis mortality rate is higher among nonwhites, and generally lower for females, it indicates that a small part of the increase in the tuberculosis death rate may be due to a change in the race-sex composition of the population.

The next point to investigate is whether or not the increase in tuberculosis mortality has resulted from a change in the age structure of the population. This may be done by determining for each age-race-sex group, the proportion of total deaths which was due to tuberculosis for the 2 years 1944 and 1943. If the increase in the crude tuberculosis death rate is due to a change in the age composition of the population, the age specific death ratios may be expected to remain practically the same over the 2 years. If the ratios for 1944 are higher than the corresponding figures for 1943, the indications are that the course of tuberculosis mortality has been less favorable than that of the total death rate.

As may be seen from table 7, the increase in proportionate mortality for tuberculosis has not been general in all age-race-sex groups. There has been some increase for whites under 15 years, and in the age group 45–64 years. This is true for both sexes. However, at the same time, there has been a reduction in the ratios for both sexes in the age groups 15–44, and 65 years and over. Among nonwhite males, on the other hand, there were considerable increases in the ratios for age groups under 15, and 15–44, a small increase for the age group 65 years and over, and a slight reduction for the 45–64 year age group. Among nonwhite females increases were recorded only for the youngest and the oldest age groups, with a reduction in the ratios for those between 15 and 64 years. This analysis of the death ratios suggests that the increase in tuberculosis mortality in Arizona has not been

TABLE 7.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes, by age, race, and sex: Arizona, 1942–44*

Race, sex, and year	All ages	Age			
		Under 15 years	15–44 years	45–64 years	65 years and over
White male:					
1944	12.0	2.4	20.6	20.2	3.1
1943	11.4	1.8	25.3	17.4	3.7
1942	11.6	1.9	26.2	17.1	3.3
White female:					
1944	8.8	4.0	29.3	7.3	1.2
1943	9.0	2.6	33.7	5.5	2.1
1942	8.6	2.8	28.9	8.4	1.5
Nonwhite male:					
1944	18.2	8.1	40.1	14.9	9.4
1943	15.0	6.4	34.2	17.5	9.1
1942	16.8	10.8	32.0	18.3	7.9
Nonwhite female:					
1944	20.1	14.7	40.3	9.5	10.7
1943	18.4	7.3	52.7	12.7	5.3
1942	21.6	15.9	39.8	20.3	6.8

as alarming as may be implied from the 25-percent increase in the death rate. It is very likely that a large part of the increase is only apparent and results from considerable changes in the age-race-sex structure of the population. There were, however, some real increases in tuberculosis mortality as compared with total mortality among nonwhite males.

In a similar manner the decrease in the death rate for North Dakota may be analyzed. In 1944 there were 86 deaths from tuberculosis among residents of North Dakota, a decrease of 37, or 30 percent, from that in 1943. At the same time, there has been a reduction of only 1 percent in the number of deaths from all causes. Here again, it is unlikely that the reduction in the number of deaths from tuberculosis was a result of a decrease in the population. Table 8 shows also that

TABLE 8.—*Percent distribution of deaths from all causes by race and sex groups: North Dakota, 1944 and 1943*

Race and sex groups	Percent distribution of deaths from all causes	
	1944	1943
Total	100.0	100.0
White male	58.5	58.6
White female	39.0	38.6
Nonwhite male	1.2	1.4
Nonwhite female	1.3	1.4

the differences in race-sex composition of the population as indicated by the race-sex distribution of total deaths have not been sufficiently great to account for the decrease in tuberculosis deaths.

Proportionate mortality for tuberculosis as presented in table 9 reveals that there has been a real decrease in tuberculosis mortality

TABLE 9.—*Deaths from tuberculosis (all forms) as percentages of deaths from all causes, by age, race, and sex: North Dakota, 1942–1944*

Race, sex, and year	All ages	Age			
		Under 15 years	15–44 years	45–64 years	65 years and over
White male:					
1944	1.4	0.8	4.8	2.0	0.6
1943	1.8	.3	9.1	2.1	.7
1942	1.8	.8	6.2	2.6	.7
White female:					
1944	1.4	.0	9.9	1.6	.1
1943	2.3	.8	10.9	1.9	.7
1942	2.0	1.2	11.2	1.8	.4
Nonwhite male:					
1944	7.9	9.1	16.7	0	5.9
1943	10.7	7.7	18.8	20.0	0
1942	22.2	0	75.0	21.7	11.1
Nonwhite female:					
1944	15.6	3.3	58.3	33.3	0
1943	19.7	4.2	68.4	0	0
1942	21.0	15.8	48.1	7.1	0

among females of all ages. In fact, while the total number of deaths among white females was only 1 less than the 1,995 deaths recorded in 1943, the number of tuberculosis deaths decreased from 45 to 28. There has been also a very marked decline in the proportionate mortality for white males 15–44 years. The total number of deaths in 1944 remained nearly the same as in 1943, while the number of tuberculosis deaths in this age group was reduced from 27 to 14. Among nonwhites no consistent change is noted through all the age groups. It may, therefore, be concluded from these figures that there has been in North Dakota a real decrease in tuberculosis mortality relative to mortality from all causes. The largest relative decrease occurred among males aged 15–44 years. The reduction in tuberculosis mortality for nonwhite females has been uniform through all age groups. Among males, other than those 15–44 years, and among nonwhites, tuberculosis mortality changed approximately to the same extent as did the death rate for all causes.

Although care must be exercised in the interpretation of proportionate mortality, the information furnished by these ratios is useful in the evaluation of the status and direction of change in tuberculosis mortality in the absence of detailed population statistics. It should be noted that the entire analysis of proportionate mortality is based upon death statistics without reference to population estimates. The data necessary for such an analysis are available currently in every State vital statistics office.

Tuberculosis Death Rate in 1942–44 Compared With 1939–41

The average *de facto* death rate from tuberculosis (all forms) for the period 1942–44 was 42.3, or 7.6 percent lower than the rate of 45.8 for the period 1939–41. The last column in table 5 presents for each State a comparison of the death rates for the two periods, 1939–41, and 1942–44. It may be seen that the reduction in the death rate from tuberculosis has been widespread. The rate for 38 States was lower during the war period than in the prewar period; there were increases in the rates for 10 of the States, and the rate for one State remained the same during the two periods.[7] Increases in the rate were slight in a number of States but ranged to a maximum of 7.2 percent for Massachusetts. Although some of the decreases were slight, half were over 10 percent, and the maximum was nearly 25 percent (Florida).

The geographic distribution in the percentage changes in the rates between the two periods is shown in figure 7. The States for which the death rate has increased or remained practically stationary throughout the period are to be found in the northern part of the

[7] Some of these changes in rate are not statistically significant. In addition, many of these may be due to the effect of changes in population composition and to the fact that the size of the population in each State is an estimate rather than a census enumeration and, therefore, may contain errors of unknown magnitude.

country, and consist of all of the New England States except Vermont and New Hampshire, the industrial States of Pennsylvania, New Jersey, New York, and Michigan, and the States of Minnesota, the Dakotas, and Idaho. The areas in which the tuberculosis death rate exhibited large decreases are generally found in the South, extending from Delaware to Texas. Large decreases may also be observed for Wyoming, Utah, Arizona, and California. A comparison of the map in figure 7 with that in figure 6 indicates that the reductions have been smallest in those States where the rate is generally low and that many of the larger decreases have occurred in States with the highest rates.

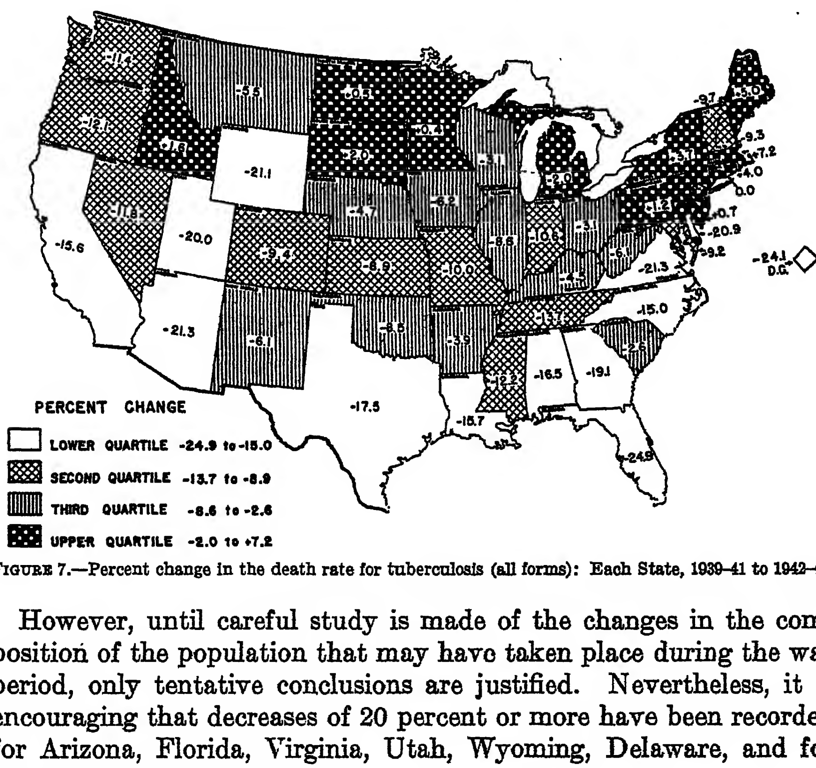

FIGURE 7.—Percent change in the death rate for tuberculosis (all forms): Each State, 1939–41 to 1942–44.

However, until careful study is made of the changes in the composition of the population that may have taken place during the war period, only tentative conclusions are justified. Nevertheless, it is encouraging that decreases of 20 percent or more have been recorded for Arizona, Florida, Virginia, Utah, Wyoming, Delaware, and for the District of Columbia.

Examination of the tuberculosis death rates for each State for 1942, 1943, and 1944 reveals that tuberculosis mortality in several States has increased steadily during the war. These States are Idaho, Maine, Nebraska, Pennsylvania, Vermont, and West Virginia.

Place of Death and Place of Residence

The ratio of the number of tuberculosis deaths by place of death to the number by place of residence of the deceased may be considered as a measure of the amount of interstate migration of tuberculous patients. In general, the differences between the number of tuber-

culosis deaths which occurred in the State and the number of deaths to residents of the State is small for nearly all States. The few notable exceptions are Arizona, Colorado, New Mexico, and North Carolina. In Arizona in 1944, the number of deaths recorded as having occurred in that State was 27 percent higher than the number occurring among its residents. In Colorado and New Mexico there were 21 percent more deaths by place of death than by place of residence, and in North Carolina the excess was 12 percent. Maryland reported 7 percent more deaths occurring in that State than the number of deaths among its residents, but this is primarily due to the location of a tuberculosis sanatorium in that State which belongs to and serves the residents of the District of Columbia.

Deaths From Respiratory and Nonrespiratory Forms of Tuberculosis

Of the 54,731 deaths from tuberculosis in 1944, 50,712, or 92.7 percent, were from tuberculosis of the respiratory system and 4,019, or 7.3 percent, were from other forms of tuberculosis. The death rate from respiratory tuberculosis was 38.3 per 100,000 population and that from nonrespiratory tuberculosis 3.0. In 1943 the corresponding rates were 39.1 and 3.4, respectively, and nonrespiratory tuberculosis constituted 8.1 percent of all tuberculosis deaths. It is, therefore, evident that mortality from nonrespiratory tuberculosis has declined more rapidly than that for tuberculosis of the respiratory system.

Deaths from nonrespiratory tuberculosis formed a larger proportion of all tuberculosis deaths among nonwhites (8.9 percent) than among whites (6.8 percent). This excess is accounted for entirely by males (9.3 percent among nonwhites as compared with 5.9 percent among whites). Among females the corresponding percentages were 8.5 and 8.3, respectively. In other words, while among whites the percentage of nonrespiratory tuberculosis is higher among females than among males, among nonwhites the percentage is slightly higher among males than among females.

The death rate from tuberculosis of the respiratory system for 1944 ranged from 9.6 per 100,000 population for residents of Utah to 113.7 for residents of Arizona (table 10). The distribution of respiratory tuberculosis death rates by State is quite similar to that of tuberculosis (all forms) presented in figure 6.

The death rate for nonrespiratory tuberculosis varied from 1.2 per 100,000 population for residents of Iowa and Kansas to 9.2 for residents of Arizona. The geographic distribution of death rates for nonrespiratory tuberculosis (fig. 8) is very similar to that for 1943.

In general there are two broad areas of relatively high death rates for tuberculosis of nonrespiratory forms. These are the States in the

Southwest and the Pacific Coast (Arizona, New Mexico, Nevada, California, and Washington) and the States of Delaware, Maryland, Virginia, Kentucky, Tennessee, Vermont, and the District of Columbia.

TABLE 10.—*Number of deaths and death rates for tuberculosis of the respiratory system and of other forms by State: United States, 1944*

[By place of residence]

Area	Tuberculosis (all forms)	Tuberculosis of respiratory system	Tuberculosis (other forms)		Rate per 100,000 population	
			Number	Percent	Tuberculosis of respiratory system	Tuberculosis (other forms)
United States	54,731	50,712	4,019	7.3	38.3	3.0
Alabama	1,269	1,186	83	6.5	42.1	2.9
Arizona	784	725	59	7.5	113.7	9.2
Arkansas	826	792	34	4.1	44.6	1.9
California	3,826	3,474	352	9.2	39.7	4.0
Colorado	419	389	30	7.2	33.9	2.6
Connecticut	661	616	45	6.8	34.7	2.5
Delaware	123	113	10	8.1	39.8	3.5
District of Columbia	547	488	59	10.8	52.3	6.3
Florida	823	789	34	4.1	33.3	1.4
Georgia	1,141	1,068	73	6.4	33.1	2.3
Idaho	109	94	15	13.8	17.6	2.8
Illinois	3,218	2,982	236	7.3	38.6	3.1
Indiana	1,221	1,110	111	9.1	32.5	3.2
Iowa	341	314	27	7.9	13.8	1.2
Kansas	357	336	21	5.9	18.9	1.2
Kentucky	1,726	1,590	136	7.9	60.5	5.2
Louisiana	1,158	1,087	71	6.1	42.9	2.8
Maine	279	257	22	7.9	32.4	2.8
Maryland	1,326	1,221	105	7.9	57.4	4.9
Massachusetts	1,698	1,616	82	4.8	38.8	2.0
Michigan	1,814	1,627	187	10.3	30.0	3.4
Minnesota	693	623	70	10.1	24.8	2.8
Mississippi	831	790	41	4.9	36.3	1.9
Missouri	1,487	1,391	96	6.5	38.8	2.7
Montana	175	164	11	6.3	35.3	2.4
Nebraska	211	190	21	10.0	15.7	1.7
Nevada	76	66	10	13.2	42.2	6.4
New Hampshire	105	96	9	8.6	21.0	2.0
New Jersey	1,856	1,733	123	6.6	41.6	3.0
New Mexico	345	313	32	9.3	58.9	6.0
New York	6,055	5,649	406	6.7	44.7	3.2
North Carolina	1,239	1,145	94	7.6	32.4	2.7
North Dakota	86	78	8	9.3	14.8	1.5
Ohio	2,787	2,566	221	7.9	37.6	3.2
Oklahoma	880	821	59	6.7	39.8	2.9
Oregon	307	266	41	13.4	21.9	3.4
Pennsylvania	4,020	3,765	255	6.3	40.8	2.8
Rhode Island	300	287	13	4.3	36.7	1.7
South Carolina	660	618	42	6.4	32.2	2.2
South Dakota	178	138	40	22.5	24.7	7.2
Tennessee	1,881	1,752	129	6.9	61.1	4.5
Texas	3,126	2,957	169	5.4	43.0	2.5
Utah	73	58	15	20.5	9.6	2.5
Vermont	124	113	11	8.9	36.3	3.5
Virginia	1,344	1,221	123	9.2	38.2	3.8
Washington	702	630	72	10.3	30.6	3.5
West Virginia	764	705	59	7.7	41.1	3.4
Wisconsin	726	674	52	7.2	22.7	1.7
Wyoming	34	29	5	14.7	11.3	1.9

South Dakota, surrounded by States where the rates are low, recorded the very high rate of 7.2. It is interesting to note that in 1943 South Dakota reported a similar exception with a relatively high rate while its neighboring States had low rates.

Without further detailed study it is difficult to evaluate the significance of State-to-State variation of the death rate for nonrespiratory tuberculosis. A comparison of the map (fig. 8) with the map of death rates from tuberculosis (all forms) (fig. 6) shows that although there may be some correlation between death rates for tuberculosis of the respiratory system and for other forms of tuberculosis, there are a number of striking differences. In fact, data in table 10 show that deaths from nonrespiratory tuberculosis varied from a low of 4.1 percent of all tuberculosis deaths in Arkansas and Florida to a high of 22.5 percent in South Dakota. In the midwestern States where the death rates from tuberculosis (all forms) are relatively low, deaths for nonrespiratory tuberculosis form higher percentages of the total than in the South where the rates from tuberculosis (all forms) are generally high. Among whites, the percentage which nonrespiratory formed of all tuberculosis deaths, varied from a low of 3.2 (Rhode Island) to a high of 14.8 (Utah). Among nonwhites the percentage was as high as 40.0 for the State of Nevada. (Of the 20 deaths from tuberculosis among nonwhites in Nevada, 8 were from nonrespiratory types.)

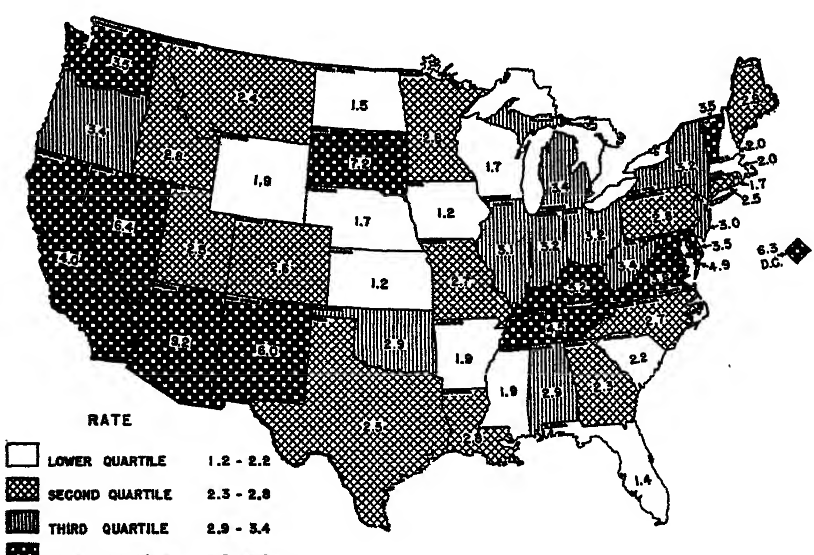

FIGURE 8.—Death rates per 100,000 population for nonrespiratory tuberculosis: Each State, 1944.

Hospitalization for Tuberculosis as Determined From Mortality Statistics

Probably the most effective way of controlling tuberculosis in a community is to isolate the infected case, preferably in a tuberculosis institution. The extent to which this is being accomplished cannot be measured adequately by mortality statistics. Patients that died in tuberculosis sanatoria may not have been in the institution for a sufficiently long period to assure adequate protection of household and other contacts from infection, and this may be especially true of such deaths that occurred in general hospitals. However, it is safe to assume that a considerable number of tuberculosis deaths that occurred in the home constituted a serious source of infection in the community. It is, therefore, important that of the 50,712 deaths from respiratory tuberculosis in 1944, 18,242 or 36 percent did not occur in an institution. In addition there were 12,606 deaths, or 24.8 percent, which occurred in general hospitals where the length of stay is generally short. Taken together these two groups account for slightly more than 60 percent of all deaths from tuberculosis of the respiratory system. However, some progress is being made in the direction of increased hospitalization. It may be seen from table 11

TABLE 11.—*Number and percent of deaths from respiratory tuberculosis in institutions, by type of service and type of control: United States, 1939–41 average, 1943, and 1944*

Type of service and type of control	Number			Percent		
	1944	1943	1939–41 average	1944	1943	1939–41 average
Total	50,712	52,407	55,444	100.0	100.0	100.0
Deaths not in institutions	18,242	19,866	24,519	36.0	37.9	44.2
Deaths in institutions	32,470	32,541	30,925	64.0	62.1	55.8
Type of service:						
General hospital	12,606	12,544	12,450	24.8	23.9	22.5
Tuberculosis hospital	14,496	14,568	13,041	28.6	27.8	23.5
Nervous and mental institutions	4,056	4,098	3,528	8.0	7.8	6.4
Other institutions	1,312	1,331	1,906	2.6	2.5	3.4
Type of control:						
Federal	3,426	2,950	2,541	6.8	5.6	4.6
State	7,969	8,138	21,871	15.7	15.5	39.4
County and city	15,157	15,473		29.9	29.5	
Nonprofit	4,806	4,759	4,727	9.5	9.1	8.5
Proprietary and unknown	1,112	1,221	1,786	2.2	2.3	3.2

that even during the war period there has been a reduction in the number and percentage of deaths which occurred in the home. For example, there were 4,653 fewer deaths from respiratory tuberculosis occurring in the home in 1943 than in the annual 3-year average for the period 1939–41. In 1944 there has been a further reduction of 1,624 from the 1943 figure. These numbers account for almost the entire reduction in the number of deaths from respiratory tuberculosis in the 2 years.

Compared with the average figure for the period 1939–41, there is a noticeable increase in deaths that occurred in tuberculosis hospitals and in nervous and mental hospitals where the stay is normally longer than in general hospitals. In 1944, there were 14,496 deaths in tuberculosis hospitals compared with the average annual number of 13,041 for the period 1939–41. In 1944, 28.6 percent of all deaths from respiratory tuberculosis and 44.6 percent of all such deaths in institutions occurred in tuberculosis hospitals. The corresponding percentages for 1939–41 were 23.5 and 42.2, respectively.

The number of deaths from respiratory tuberculosis in nervous and mental institutions in 1944 was 4,056, amounting to 8.0 percent of all deaths from respiratory tuberculosis and 12.5 percent of all institutional deaths from respiratory tuberculosis. The annual average number for 1939–41 was 3,528, amounting to 6.4 percent of all respiratory tuberculosis deaths and 11.4 percent of all institutional deaths.

Nearly one-half of the deaths from respiratory tuberculosis in institutions in 1944 occurred in county-city institutions, and nearly one-quarter occurred in State institutions. Less than one-fifth of all institutional deaths from tuberculosis occurred in institutions which were not under government ownership or control.

Analysis of the hospitalization patterns for respiratory tuberculosis by race and sex reveals a number of interesting points which should prove of value to administrators of tuberculosis control programs. In the first place, it is surprising to find that the percentage of deaths occurring outside of an institution is as great among the whites as among nonwhites (table 12). On the other hand, a considerably

TABLE 12.—*Percent of deaths from respiratory tuberculosis in institutions by type of service, by race and sex: United States, 1943 and 1944*

Race and sex	Type of service								Percent of deaths not in institutions	
	General		Tuberculosis		Nervous and mental		Other			
	1943	1944	1943	1944	1943	1944	1943	1944	1943	1944
All races, both sexes	23.9	24.8	27.8	28.6	7.8	8.0	2.5	2.6	37.9	36.0
Male	27.7	28.5	28.9	29.6	7.4	7.7	2.9	2.9	33.1	31.3
Female	17.9	19.0	26.0	26.9	8.5	8.6	2.0	2.1	45.6	43.4
White male	27.1	27.3	29.2	29.8	8.1	8.5	2.8	2.9	32.7	31.4
White female	16.7	17.2	25.6	26.5	10.0	9.9	2.3	2.3	45.5	44.0
Nonwhite male	29.5	32.2	28.0	29.0	5.1	4.8	3.0	2.8	34.4	31.2
Nonwhite female	20.5	22.7	26.8	27.8	5.4	5.6	1.5	1.5	45.8	42.4

greater proportion of the females died at home (43.4 percent) than was the case among males (31.3 percent). This sex difference may be observed in both racial groups. Thus among whites, 31.4 percent of male deaths and 44.0 percent of female deaths did not occur in an institution. The corresponding percentages among nonwhites were 31.2 and 42.4, respectively. In view of the fact that females are

generally in much closer contact with members of the household, particularly children, it is of considerable significance that such a larger proportion of them died at home.

A further review of the tabulations shows that the main difference between the sexes is accounted for by deaths in general hospitals, where 28.5 percent of all deaths from respiratory tuberculosis among males occurred and only 19.0 percent of the female deaths. This sex difference is present in each of the racial groups.

Also of interest is the fact that although the precentages of deaths that occurred in all institutions were nearly the same for the two racial groups, some differences appear between whites and nonwhites when the data are analyzed by type of institution where death occurred. A larger proportion of the nonwhite deaths occurred in general hospitals than is the case among whites. On the other hand, a larger percentage of deaths occurred in nervous and mental institutions among whites than among nonwhites

Institutional Deaths From Respiratory Tuberculosis By States

There was a large State-to-State variation in the proportion of deaths from respiratory tuberculosis that occurred in institutions. These proportions vary to a large extent, according to the availability of institutional facilities of different kinds in various States. The lowest percentage in 1944 was for the residents of Mississippi (22.5 percent) and the highest was recorded for residents of Minnesota (88.8 percent). (For residents of the District of Columbia the percentage was 89.8). The proportion of deaths that occurred in tuberculosis hospitals varied from a low of 5.3 percent in Idaho to a high of 51.3 in North Dakota, while the percentage of deaths in general hospitals varied from 7.0 in Mississippi to 57.6 in Nevada. (The percentage was 58.0 in the District of Columbia). Only 1.1 percent of all deaths from respiratory tuberculosis among residents of Arizona occurred in mental hospitals compared with 18.5 percent for those of Minnesota (table 13).

It may be of interest to indicate the States in which there have been large increases in the percentage of deaths from respiratory tuberculosis which occurred in the home between 1943 and 1944. These States are Delaware (an increase of 19.5 percent), Iowa (27.7 percent), Montana (35.4), New Hampshire (45.3), Oregon (39.9), and Utah (56.8 percent). On the other hand, a number of States showed relatively large decreases in the percentage of deaths occurring at home. These were: Idaho (a decrease of 23.7 percent), Nebraska (24.4), New Mexico (22.2), North Dakota (38.6), and Rhode Island (22.5 percent).

The percentage of deaths that occurred outside of institutions may be considered a rough index of the lack of facilities for the institutional care of tuberculosis cases. It may be seen from figure 9 that the greatest need for facilities exists in the South. More than one-half of all

respiratory tuberculosis deaths in nearly every Southern State did not occur in an institution. The most favorable hospitalization picture

TABLE 13.—*Number of deaths from respiratory tuberculosis in institutions by type of service and type of control, by State: United States, 1944*

[By place of residence]

Area	Total	Deaths not in institutions	Deaths in institutions	Type of service: General hospital	Type of service: Tuberculosis hospital	Type of service: Nervous and mental hospital	Type of service: Other institutions	Type of control: Federal	Type of control: State	Type of control: County and city	Type of control: Nonprofit	Type of control: Proprietary and unknown
United States	50,712	18,241	32,471	12,607	14,496	4,056	1,312	3,428	7,968	15,158	4,805	1,112
Alabama	1,186	862	324	92	152	60	20	59	60	111	74	20
Arizona	725	287	438	281	125	8	24	207	15	130	57	29
Arkansas	792	483	309	66	179	61	3	50	227	10	12	10
California	3,474	674	2,800	1,637	872	177	114	315	172	1,876	229	208
Colorado	389	112	277	170	75	21	11	42	18	57	136	24
Connecticut	616	119	497	112	305	68	12	19	351	38	87	2
Delaware	113	45	68	9	56	2	1	2	56	0	9	1
District of Columbia	488	50	438	283	130	18	7	105	1	317	15	0
Florida	789	307	482	212	182	47	41	53	86	280	42	21
Georgia	1,068	680	388	107	156	100	25	58	188	128	44	20
Idaho	94	29	65	44	5	5	11	17	5	11	21	11
Illinois	2,982	633	2,349	1,053	937	319	40	200	312	1,465	308	64
Indiana	1,110	534	576	197	292	68	19	57	145	305	55	14
Iowa	314	107	207	69	91	41	6	16	110	51	27	3
Kansas	336	126	210	95	80	29	6	32	108	25	44	1
Kentucky	1,590	1,156	434	133	211	75	15	71	79	199	55	30
Louisiana	1,087	532	555	387	96	63	9	76	395	17	57	10
Maine	257	74	183	36	104	38	5	14	139	2	24	4
Maryland	1,221	340	881	350	441	64	26	68	419	257	133	4
Massachusetts	1,616	267	1,349	369	735	194	51	115	313	775	133	13
Michigan	1,627	239	1,388	419	771	103	95	78	222	719	281	88
Minnesota	623	70	553	166	267	115	5	61	159	294	32	7
Mississippi	790	612	178	55	58	39	26	30	76	25	36	11
Missouri	1,391	517	874	379	319	67	109	93	196	466	100	19
Montana	164	67	97	46	45	4	2	18	45	5	20	9
Nebraska	190	44	146	87	31	26	2	17	62	43	21	3
Nevada	66	18	48	38	6	0	4	8	0	32	3	5
New Hampshire	96	40	56	9	35	11	1	1	23	3	6	23
New Jersey	1,733	319	1,414	323	853	215	23	61	163	1,005	167	18
New Mexico	313	110	203	130	67	4	2	110	34	0	54	5
New York	5,649	872	4,777	1,919	2,064	625	169	357	732	2,681	975	32
North Carolina	1,145	511	634	93	427	85	29	100	297	162	58	17
North Dakota	78	17	61	14	40	6	1	6	46	3	5	1
Ohio	2,566	844	1,722	677	761	232	52	115	245	1,093	183	86
Oklahoma	821	430	391	113	181	73	24	85	220	11	28	47
Oregon	266	68	198	51	109	29	9	28	80	43	28	19
Pennsylvania	3,765	1,203	2,562	1,127	906	404	125	154	827	916	643	22
Rhode Island	287	61	226	33	122	19	52	16	137	52	20	1
South Carolina	618	243	375	64	277	34	0	23	223	95	34	0
South Dakota	138	43	95	30	46	18	1	41	41	1	11	1
Tennessee	1,752	1,213	539	155	279	77	28	51	77	242	151	18
Texas	2,957	1,944	1,013	349	481	149	34	136	247	417	136	77
Utah	58	20	38	20	13	2	3	10	13	8	3	4
Vermont	113	48	65	15	44	6	0	3	44	2	16	0
Virginia	1,221	672	549	158	307	66	18	71	218	170	66	24
Washington	630	114	516	202	219	63	32	101	64	236	59	56
West Virginia	705	346	359	75	209	65	10	19	269	6	40	25
Wisconsin	674	131	543	148	326	60	9	52	50	371	65	5
Wyoming	29	8	21	10	9	1	1	7	9	3	2	0

is presented by the States in the Great Lakes region, as well as by New York, Massachusetts, Connecticut, New Jersey, California, Washington, and the District of Columbia. In these States less than one-fifth of all deaths from respiratory tuberculosis occurred at home.

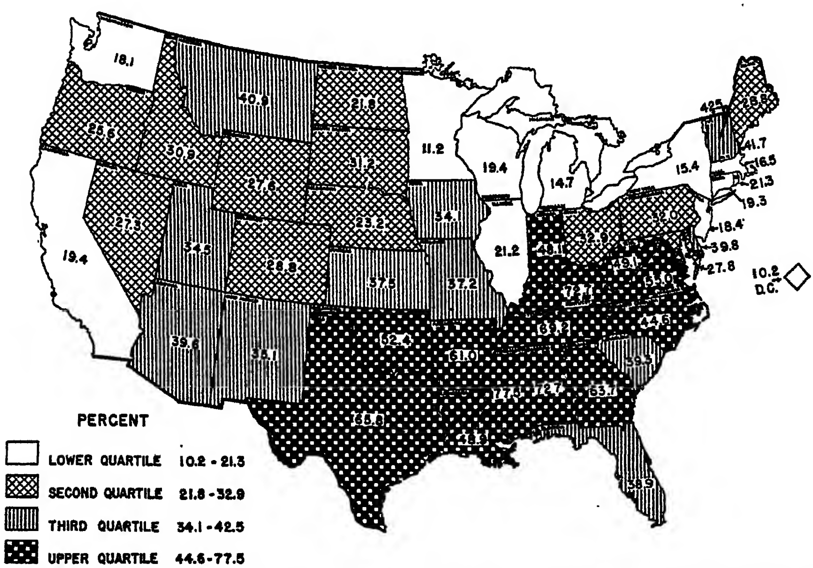

FIGURE 9.—Percent of deaths from respiratory tuberculosis occurring outside of hospitals and institutions; Each State, 1944.

Summary

This paper presents an analysis of data for 1944 on tuberculosis mortality in the United States and in each State, and a comparison of the death rates from tuberculosis for the 3 war years, 1942–44, and for the prewar period 1939–41.

The number of deaths from tuberculosis (all forms) in 1944 was 54,731, the death rate being 41.3 per 100,000 population. The rates for white females and for nonwhites of both sexes continued to decline while that for white males showed little change.

Death rates for tuberculosis (all forms) were highest for nonwhite males and lowest for white females. They were higher in the older age groups than in the younger. Among children and young adults, the rates were higher for females than for males. In the older age groups, the rates were much higher for males.

Death rates for tuberculosis (all forms) were lower in 1942–44 than in 1939–41 in all age groups with the exception of males aged 65 years and over where there has been an increase in the rate.

There were 4,370 deaths from tuberculosis (all forms) among veterans of all wars. Of these 981 were among World War II veterans

and 3,009 among veterans of World War I. The percentage of deaths occurring in institutions was much greater among veterans (86.1 percent) than among the general population (64.0 percent). It was slightly higher among veterans of World War II (89.3 percent) than among World War I veterans (84.8 percent).

The tuberculosis death rate for individual States ranged from a low of 12.0 for Utah to a high of 122.9 for Arizona. The reduction in rate from 1943 was widespread and occurred in 32 of the States. However, in 16 States there was an increase in the rate. The largest increase was reported for residents of Arizona (25.2 percent) and the largest decrease for residents of North Dakota (28.2 percent).

The death rate for the period 1942–44 was 42.3, or 7.6 percent lower than the rate of 45.8 for the period 1939–41. Reductions occurred in 38 States and increases in 10. The highest increase was for Massachusetts (7.2 percent), and the greatest reduction occurred in Florida (24.9 percent). The smallest reductions occurred in the New England and Middle Atlantic States. There were 10 States in which the number of tuberculosis deaths in 1944 was greater than the average annual number for the period 1939–41.

Nearly 93 percent of the tuberculosis deaths in 1944 were of the respiratory system. The proportion of nonrespiratory tuberculosis varied from 4.1 percent for residents of Arkansas and Florida to 22.5 percent for residents of South Dakota.

Of the 50,712 deaths from respiratory tuberculosis in 1944, 32,470, or 64 percent, occurred in institutions; 12,606 deaths, or 24.8 percent, in general hospitals; 14,496, or 28.6 percent, in tuberculosis hospitals; 4,056, or 8.0 percent, in nervous and mental institutions; and 1,312, or 2.6 percent, in other institutions. There were 18,242 deaths, or 36.0 percent, occurring in the home. The percentage of tuberculosis deaths in institutions was as great among nonwhites as among whites. A considerably greater proportion of deaths among females occurred in the home (43.4 percent) than was the case among males (31.3 percent).

The percentage of respiratory tuberculosis deaths occurring in institutions varied from 22.5 percent for residents of Mississippi to 88.2 percent for residents of Minnesota. The range in the proportion of deaths in institutions by type of service was also very large.

Because of the large changes in the population and its composition, the evaluation of the tuberculosis mortality problem during the war is difficult. This is particularly true of data for individual States. However, for the country as a whole, reference is also made wherever possible, to *de jure* death rates for tuberculosis, which are more comparable to the rates for the pre-war years, because of the inclusion of data for the armed forces overseas.

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A METHOD OF CONDUCTING THE 50 PERCENT HEMOLYSIS END POINT COMPLEMENT-FIXATION TEST FOR PARASITIC DISEASES [1]

By JOHN BOZICEVICH, *Senior Zoologist;* HELEN M. HOYEM, *Zoologist;* and VERNAL M. WALSTON, *Laboratory Technician, United States Public Health Service*

Those who have conducted complement-fixation tests for helminthic and protozoan diseases have soon discovered that the complex nature of the antigens renders the tests unreliable, a result mainly due to the anticomplementary effect of the antigen. It is believed that the technique described below will eliminate most of the difficulties encountered previously. This test is similar in nature to the techniques of Wadsworth (*1*), Wadsworth, Maltaner, and Maltaner (*2*), and Kent, Bucantz, and Rein (*3*). The complement titer is determined on the basis of that amount which will give 50-percent hemolysis when compared to the color standard. The test is conducted in a total volume of 1 cc. in which 4 of these 50-percent units are used.

Preparation of the 2-percent cell suspension.—Before the optimal amboceptor titer is determined, it is necessary to prepare a 2-percent suspension of cells from which a color standard is made in order to determine the end point for 50-percent hemolysis. Sheep cells are collected by using sodium citrate or by defibrination. If it is desired to hold the cells for a period over 3 days, a portion should be removed from the original collecting container and washed four times with physiologic saline solution. If it is necessary to perform titrations with the same cell suspension for a period of several weeks, it will be

[1] From the Zoology Laboratory, National Institute of Health.

found advisable to use Alsever and Ainslie's (*4*) solution or Bucantz, Rein, and Kent's (*5*) modification of this solution for the preservation of cells to reduce fragility and consequent hemolysis. After the final washing has been completed, a 15-cc. graduated, conical centrifuge tube is filled with washed cells which are centrifuged at 2,000 r. p. m. for 10 minutes. The quantity of packed cells is measured and the volume occupied by the cells is multiplied by a factor of 50 to make a 2-percent suspension. This will give the total volume which must be made up with saline. Thus, if the volume of packed cells is 1.5 cc., then $1.5 \times 50 = 75$ cc. Therefore, the contents of the tube can be poured into a graduated cylinder and the centrifuge tube washed with saline. The washings are added to the graduated cylinder. Saline is then added until a volume of 75 cc. is reached.

Preparation of the hemoglobin standard.—After the 2-percent cell suspension is made, 10 cc. of it is pipetted into a graduated centrifuge tube and packed at 2,000 r. p. m. for 10 minutes. Without disturbing the cells, almost all of the supernatant fluid is withdrawn by means of a capillary pipette. Distilled water is added up to the 9.50-cc. mark; the cells laked completely by shaking; and 0.50 cc. of a stock buffer solution or the same volume of a 17-percent saline solution added to restore tonicity.

Stock buffer solution

NaCl	17.00 gm.
Na_2HPO_4	1.13 gm.
KH_2PO_4	0.27 gm.
Distilled water to make	100.00 cc.

This stock solution may be employed in place of saline as a diluent for all the reagents if 1 part of the stock solution is added to 20 parts of distilled water.

After preparing the standard hemoglobin solution, the color standard is prepared from it in the same diameter tubes which are to be used in the test proper. Since the total volume in the test is 1 cc., all the titrations are conducted on the same volume and the measurement of the reagents given in all the tables henceforth will be in tenths of a cubic centimeter.

TABLE 1.—*Preparation of color standard*

Percent of hemolysis	0	10	20	30	40	50	60	70	80	90	100
Saline	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Standard hemoglobin	0	.02	.04	.06	.08	.10	.12	.14	.16	.18	.20
2 percent red cells	.20	.18	.16	.14	.12	.10	.08	.06	.04	.02	0

The tubes are shaken and labeled according to the degree of hemolysis and then centrifuged at 2,000 r. p. m. for 10 minutes.

Titration of amboceptor.—It is advisable to begin the titration of amboceptor with a 1:2,000 dilution; if the pooled amboceptor does

not attain this titer it is not satisfactory and the animals should be given further immunization. To prepare the sensitized cells for this titration, the amboceptor dilution desired is made up in 10-cc. amounts and an equal volume of the 2-percent cell suspension is added. The sensitized cells must be prepared 15 minutes before using them in the test. A 1:100 dilution of complement is prepared from the pooled serum of several guinea pigs.

The tubes for the initial titration of amboceptor are arranged according to table 2. In this preliminary titration of amboceptor, the complement titration is performed at the same time.

TABLE 2.—*Amboceptor titration*

Tube No.	1	2	3	4	5	6	7	8	9	10
Saline	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10
Complement	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
Sensitized cells	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40

The above arrangement is made for each dilution of amboceptor to be tested. The titration is then placed in a 37° C. water bath for 30 minutes after which it is removed and the tubes centrifuged at 2,000 r. p. m. for 10 minutes. Each tube is then compared with the color standard tubes and the results in percent of hemolysis are recorded according to the plan given below:

TABLE 3.—*Reading of amboceptor titration*

Tube No.	1	2	3	4	5	6	7	8	9	10
Amboceptor dilution										
1:7,000	0	0	0	0	5	10	20	25	35	45
1:6.500	0	0	0	8	20	30	40	55	65	68
1:6,000	0	0	3	10	25	35	50	60	65	70
1:5,500	0	0	5	15	35	45	55	70	80	85
1:5,000	0	0	8	30	50	60	80	85	90	95
1:4,500	0	0	20	40	60	70	85	88	95	98
1:4,000	0	0	25	50	75	80	85	90	95	100
1:3,500	0	10	30	60	80	85	95	100	100	100
1:3,000	0	30	55	80	90	95	98	100	100	100
1:2,500	0	35	60	85	98	98	100	100	100	100
1:2,000	2	37	65	90	95	100	100	100	100	100

The optimal dilution of amboceptor as defined by Wadsworth (*1*) is that dilution beyond which further increase in the concentration of amboceptor does not appreciably change the quantity of complement required for 50 percent hemolysis. Therefore, from the above titration it is apparent that the optimal dilution of amboceptor is 1:3,000. This concentration is used henceforth for the daily titration of complement and for the sensitization of red cells for the test proper. The above titration served a dual purpose in this instance in that both the complement and amboceptor titration were conducted at the same time.

Titration of complement.—The complement is titrated daily with the optimal dilution of amboceptor as indicated in the above table. Fresh, pooled serum obtained from several guinea pigs is diluted 1:100 and the titration is made according to table 1. In this titration only the optimal dilution of amboceptor is used. After incubation and centrifugation, each tube in the test is compared to the 50 percent hemolysis tube in the color standard. The color standard must be prepared fresh daily with a portion of the cells from the same lot which is to be used in the test proper. If the color standard tube containing the 50 percent hemolysis matches exactly tube No. 3 of the titration containing 0.15 cc. of 1:100 complement, tube No. 3 is regarded as 1 unit of complement. If the 50 percent color standard falls between 2 tubes, it is necessary to interpolate to obtain the 1 unit of complement. Since 4 units of complement are required in each 0.20 cc., the dilution of complement is made according to the following formula: $4\times0.15=0.60$ cc. of 1:100 complement. Consequently $\frac{0.60}{100}=\frac{0.20}{x}=33.3$. Therefore, 0.20 cc. of a 1:33.3 dilution of complement will be required for the test. This dilution is also employed in the controls in order to determine quantitatively the amount of complement which may deteriorate in the presence of serum, antigen, and saline alone.

METHOD OF CONDUCTING THE DIAGNOSTIC TEST

The serum submitted for the complement-fixation tests should be inactivated for 30 minutes at 56° C. just prior to being used. If the serum was inactivated the day before, it is advisable to reheat the serum at the above-mentioned temperature for about 5 minutes before using it. Two dilutions of serum are employed in the test, 1:5 and 1:10 dilutions. The test is arranged and the reagents added in the order given in table 4. The optimal dilution of the specific antigen should be employed.

TABLE 4.—*The test proper*

Tube No.	1	2	3	4	5	6	7	8	9	10	11
Reagents											
Saline	------	------	0.30	0.25	0.20	0.30	0.25	0.20	0.30	0.25	0.20
Serum 1:5	0.20	------	.20	.20	.20	------	------	------	------	------	------
Serum 1:10	------	0.20	------	------	------	.20	.20	.20	------	------	------
Complement (4 units)	.20	.20	.10	.15	.20	.10	.15	.20	.10	.15	.20
Antigen	.20	.20	------	------	------	------	------	------	.20	.20	.20

The tubes are placed in the refrigerator overnight (15–18 hours) at 5° C. The next day 0.40 cc. of sheep cells which have been sensitized 15 minutes previously are added to each tube and the tubes placed

in a 37° C. water bath for 30 minutes. They are then removed and read.

INTERPRETATION OF RESULTS

In the usual complement-fixation technique the amount of complement which will deteriorate overnight in the presence of serum or antigen is not taken into consideration. By the procedure described in this paper, it can be seen that the amount of deterioration which might occur with any given serum sample is taken into consideration in evaluating the final results of the test. For the purpose of convenience this deteriorating factor will be called the binding power of the serum or of the antigen. In table 4, tubes No. 3, 4, and 5 contain, respectively, 2, 3, and 4 50-percent units of complement to determine the binding power of the 1:5 serum dilution. Tubes No. 6, 7, and 8 containing, respectively, 2, 3, and 4 50-percent units of complement should give the amount of complement bound in the 1:10 serum dilution. Tubes No. 9, 10, and 11 should show the quantity of complement bound by the antigen employed in the test. Thus, it can be seen that the binding power is determined for both dilutions of serum and the antigen employed in the test if any binding should exist. It is necessary to conduct binding powers on every single serum used in the test, but it is only necessary to conduct one set of binding powers for the antigen for the particular day that the antigen is used.

Tubes containing 30, 50, 70, and 100 percent cells, respectively, of the color standard are removed and shaken thoroughly. Any tube in the test matching the tube containing 30 percent cells or more is regarded as a positive, and any tube showing less than 30 percent fixation is regarded as negative. The procedure given in this article is intended for general laboratory use since most laboratories do not usually possess a spectrophotometer for refined measurements.

The advantage of the present method of conducting the complement fixation test may be readily illustrated by a few examples. If a serum should give the following fixation results, it is apparent from tubes No. 3, 4, and 5 that the serum itself will bind 3 units of the complement.

Tube No.	1	2	3	4	5	6	7	8	9	10	11
1:5 serum	++++		++++	+++	–						
1:10 serum		+				++++	+	–			
Antigen									–	–	–

Yet, with the usual methods, tube No. 5 would be the control tube and the test would have been regarded as satisfactory. However, the second serum dilution 1:10 also has some binding as disclosed by tube

No. 7. This serum is regarded as a negative when the present method of complement fixation is employed. If the serum showing the binding displayed in the above example had any antibodies present the titer would have been much higher.

At times, it has been found that antigen will begin to deteriorate and tests are made to guard against this, as shown by the following example:

Tube No.	1	2	3	4	5	6	7	8	9	10	11
1:5 serum	++++		−	−	−						
1:10 serum		++++				−	−	−			
Antigen									++++	+++	−

In this case, it is apparent that the antigen, as disclosed by tubes No. 9 and 10, binds at least 3 units of the complement by itself. Again tube No. 11, which is the usual control in other tests, is negative and the antigen would have been regarded as satisfactory. In this instance, it is necessary to repeat the test with a new and satisfactory antigen.

In the following example the test is regarded as positive:

Tube No.	1	2	3	4	5	6	7	8	9	10	11
1:5 serum	++++		++++	++	±						
1:10 serum		++++				+++	±	−			
Antigen									−	−	−

The test is regarded as positive because the serum gave good fixation in the 1:10 dilution and in this dilution the anticomplementary effect of the serum is practically removed. The 1:5 dilution could not be read safely because of the strong anticomplementary tendencies.

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(*2*) Wadsworth, Augustus; Maltaner, Frank; and Maltaner, Elizabeth: Quantitative studies of the complement-fixation reaction with syphilitic serum and tissue extract; technic of the practical quantitative test. J. Immunol., **35**: 217–234 (September 1938).

(*3*) Kent, J. F.; Bucantz, S. C.; and Rein, C. R.: Studies in complement-fixation. I. Spectrophotometric titration of complement, construction of graph for direct determination of the 50 percent hemolytic unit. J. Immunol. (In press.)

(*4*) Alsever, John B., and Ainslie, Robert B.: A new method for the preparation of dilute blood plasma and the operation of a complete transfusion service. New York State J. Med., **41**: 126–135 (January 1941).

(*5*) Bucantz, S. C.; Rein, C. R.; and Kent, J. F.: Studies in complement-fixation. II. Preservation of sheep's blood in citrate-dextrose mixtures (modification Alsever's solution) for use in the complement-fixation reaction. J. Lab. & Clin. Med. (In press).

STREPTOMYCIN IN EXPERIMENTAL PLAGUE [1]

By J. W. Hornibrook, *Surgeon, United States Public Health Service*

Recently Schatz, Bugie, and Waksman (*1*) isolated from an organism resembling *Actinomyces griseus* a substance, streptomycin, which is more active against several organisms than is streptothrycin. Its toxicity is low (LD 0–35 mg.; LD 100–135 mg. per 20-gm. mouse with a preparation containing 30,000 units per gram) (*2*). In view of its possibilities as a therapeutic agent in human plague the following tests were made.

MATERIALS AND METHODS

The material[2] used in these experiments contained approximately 200,000 units of streptomycin per gram.

The toxicity of this preparation was not properly tested because of a shortage of material. However, one 14-gm. mouse given 20 mg. as a 5-percent solution intraperitoneally died in 20 minutes while one 15-gm. mouse receiving 10 mg. survived. A 16-gm. mouse given subcutaneously 40 mg. as a 5-percent solution in distilled water survived.

Serial dilutions of the material were made in a liquid medium consisting of tryptose 1.5 percent, sodium chloride 0.5 percent, and glucose 0.1 percent. Dilutions were threefold and ran from 1/4,000 to 1/972,000. All tubes were inoculated with a broth culture of *Pasteurella pestis* and incubated 3 days at 37° C. Growth or inhibition was determined by turbidity.

In animal experiments, mice weighing about 18 gm. were inoculated subcutaneously in the groin with 0.2 cc. of a suspension of *P. pestis* in 1-percent peptone water. The inoculum contained up to 6,000 organisms as determined by plating methods. The streptomycin was inoculated intraperitoneally as a 1-percent solution at various times and in varying amounts. Controls were given the same volume of normal saline at the time the test animals received the drug.

In two tests (tables 4 and 5), treatment was started 3 and 2 days, respectively, following inoculation with live organisms. Visible swelling at the site of inoculation was considered one of the signs of infection; therefore at the time treatment was started animals not showing visible swelling in the groin (and those that had died) were excluded from the experiment. The remainder were treated. Sulfadiazine was also used for purposes of comparison; results are shown in table 5.

[1] From The States Relations Division (Plague Laboratory, San Francisco, Calif.). This paper was received for publication Oct. 16, 1944, and scheduled for publication in Public Health Reports in the issue of Nov. 10, 1944. Because of the subject matter the paper was withheld from publication at that time.

[2] Streptomycin was supplied through the courtesy of Merck & Co., Inc., Rahway, N. J.

At the end of 14 days from the time of inoculation, all surviving animals were killed, autopsied, and the spleens cultured (circumstances prevented spleen culture in the last experiment). Animals dying during the test were autopsied, but spleen cultures were not made, as decomposition made the isolation of pure cultures difficult. Spleen smears were made on all animals in which the post-mortem appearance was not typically that of plague in all its details. When typical bipolar organisms were found the spleen smears were considered positive. In diagnosing plague by post-mortem appearance, the following signs were looked for: Local lesions; enlarged lymph nodes; injected skin; soft, dark, enlarged spleen; lesions in the liver, lungs, and spleen. Spleen cultures were made by rubbing the cut surface of the spleen on the surface of a tryptose-glucose agar plate. A number of the positive cultures were checked by transfer of the typical colonies to tubes where fermentation of the various sugars was checked.

RESULTS

Streptomycin (both unheated and heated) inhibits the growth of *P. pestis* in broth, as shown in the accompanying table.

TABLE 1

	Dilution of drug which—	
	Inhibits growth of *P. pestis*	Allows growth of *P. pestis*
Streptomycin unheated	1/160,000	1/320,000
Streptomycin heated 56° C. 30 minutes	1/160,000	1/320,000
Streptomycin heated 100° C. 10 minutes	1/160,000	1/320,000

To test the prophylactic action of the drug mice were inoculated with plague subcutaneously, and varying amounts of streptomycin given intraperitoneally ½ hour before and 17 and 24 hours after challenge. It seemed justifiable to consider mice dead 14 days following plague inoculation to have died from plague. However, autopsies were done with the following results. All of the animals which died showed evidence of plague on the basis of either gross pathology, or spleen smears, or both. Two of the four controls killed at the end of 14 days had local lesions, and one had a bubo on the side opposite to the site of injection. One of the mice receiving dosage of 1 mg. and one receiving 0.5 mg. had enlarged inguinal nodes. The remainder were essentially normal. Spleens of all of the mice killed were negative on culture. Results of the test are tabulated in table 2.

TABLE 2

Streptomycin dosage (milligrams per dose)	Mortality		
	Number of animals	Number dead in 14 days	Percent dead in 14 days
0.0 (controls)	15	11	74
2.0	10	0	0
1.0	5	1	20
0.5	5	4	80

The above test was repeated, but the drug was given ½ hour before and 24 hours after infection (making two instead of three doses). In addition, in one group treatment was not started until 2 days following infection. Results found at autopsy were as follows. All animals which died showed evidence of plague on the basis of either gross pathology, or spleen smears, or both. Surviving animals were killed on the fourteenth day. Three of the controls showed enlarged inguinal glands. One mouse receiving 1 mg. and one receiving 0.5 mg. had local lesions. One mouse given 0.5 mg. had both local and splenic lesions. One mouse given delayed treatment had local lesions. Spleen cultures of one mouse receiving 2 mg. and one receiving 0.5 mg. were positive for plague. All other spleen cultures from killed mice were negative. Results of the tests are shown below.

TABLE 3

Streptomycin dosage (milligrams per dose)	Mortality			Average survival in days
	Number of animals	Number dead in 14 days	Percent dead in 14 days	
0.0 (controls)	10	7	70	7.6
2.0	10	0	0	
1.0	5	1	20	
0.5	5	3	60	
2.0 (first dose 48 hours after challenge)	5	4	80	9.7

In order to determine the effectiveness of streptomycin after the infection had developed, 30 mice were challenged with live organisms. At 72 hours, 2 were dead and 3 showed no swelling at the site of inoculation; these were discarded. The remainder were treated. Two doses were given with a 24-hour interval between. All animals that died showed evidence of plague on the basis of gross pathology or spleen smears, or both. All surviving animals killed on the fourteenth day had enlarged nodes and one had a local lesion; the cultures from the spleens were negative. Results are shown in table 4.

The test appeared a bit drastic as several of the mice had died before treatment had started. In the following test, treatment was started

TABLE 4

Streptomycin dosage (milligrams per dose)	Mortality			Average survival in days
	Number of animals	Number dead in 14 days	Percent dead in 14 days	
0.0 (controls)	9	9	100	6.0
4.0	7	7	100	9.1
2.0	9	6	66	7.8

48 hours after infection and a dose given daily for 6 days. In addition, a control was run with sodium sulfadiazine in the same dosage except for the first dose, which was 5 mg. rather than 2 mg. Thirty-six mice were given live organisms, and 48 hours later six were discarded as they showed no inguinal swelling. The remainder were treated. All mice which died showed evidence of plague on the basis of gross pathology or spleen smears, or both. All mice killed on the fourteenth day showed swollen inguinal glands. Spleen smears were negative except for one streptomycin-treated mouse which showed an occasional organism. Results of this series are shown in table 5.

TABLE 5

Dosage in milligrams and drug	Mortality			Average survival in days
	Number of animals	Number dead in 14 days	Percent dead in 14 days	
0.0 (controls)	9	8	88	6.1
2.0 sodium sulfadiazine	11	7	63	7.4
2.0 streptomycin	10	1	10	12.0

SUMMARY

Streptomycin is thermostable. It is inhibitory to *P. pestis* in broth in a dilution of approximately 1/160,000 (using a 200,000 unit per gram preparation).

When 2 mg. (400 units) of streptomycin were given before and 2 mg. 24 hours after challenge, 10 mice survived for 14 days a dose of plague organisms which killed 70 percent of the controls.

When treatment (2 mg. per day) was started 2 days following inoculation and continued for 6 days, 9 of 10 mice survived for 14 days. When sodium sulfadiazine was used under the same circumstances, 4 of 11 survived; 8 of 9 controls died.

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SEQUESTRATION OF CALCIUM AND MAGNESIUM IN THE PRESENCE OF ALKALINE DETERGENTS [1]

By EDWARD H. MANN, *Assistant Sanitarian (R)*, and C. C. RUCHHOFT, *Principal Chemist, United States Public Health Service*

Uncontrolled water hardness is detrimental to cleaning processes in which alkaline compounds or soap are used at elevated temperatures. Hardness in natural waters is due to the solution of calcium and magnesium salts. These salts vary in concentration in supplies throughout the United States from 5 p. p. m. to about 500 p. p. m. expressed as calcium carbonate. With few exceptions the alkalies used in detergents form insoluble compounds with calcium and magnesium and both are precipitated when water is heated.

Water hardness interferes with cleaning processes in two ways, by reducing the active detergent content of the solution through precipitation, necessitating the use of greater amounts of detergent, and by producing films and water spots on the cleaned utensil.

The solubilities of calcium salts produced by the usual alkalies employed in detergents are very low, ranging from 20 p. p. m. to 90 p. p. m., while those of magnesium are somewhat higher, being from 100 p. p. m. to 200 p. p. m. Certain synthetic detergents or wetting agents used in commercial detergents also react with the hardness of the water to give precipitates of calcium and magnesium salts.

The elimination of these troublesome factors may be brought about in two ways, by complete softening of the water prior to use, which in most cases is impossible or at least impractical, or by using certain complex polyphosphates which have the ability to sequester the hardness of the water, thus inhibiting the formation of insoluble calcium and magnesium salts.

The term sequestration implies that property of a compound or mixture which enables it to form soluble salts with the calcium and magnesium present in natural waters, thus preventing their precipitation by heat or by other substances present.

There are three compounds commonly employed in the manufacture of detergents which possess the property of sequestration, namely, sodium hexametaphosphate, tetrasodium pyrophosphate, and sodium tetraphosphate.

Sodium hexametaphosphate and sodium tetraphosphate must be used in a mixture containing other alkaline materials, due to their lack of active alkalinity and practically neutral pH values. Tetrasodium pyrophosphate, on the other hand, has a considerably higher active alkalinity and higher pH value and may be used without fortification with other alkalies for some cleaning operations.

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[1] From the Sanitary Engineering Division, Water and Sanitation Investigations, Cincinnati, Ohio.

Tests were run on various mixtures of these three sequestering agents with other commonly employed alkalies, namely, sodium hydroxide, sodium carbonate, trisodium phosphate, sodium metasilicate and sodium sesquisilicate, to determine how much hardness could be sequestered. These tests were run for both calcium and magnesium at temperatures of 140° F. and 200° F.

EXPERIMENTAL METHOD

A total concentration of 0.3 percent dissolved material including both the sequestering agent and the alkaline detergent was chosen as the average concentration of detergent recommended for use in food and dairy sanitizing processes. Various ratios of the alkalies and each of the sequestering agents were made up with a total concentration of 0.3 percent and the solutions were heated to 140° or 200° F., as desired for the particular test. These temperatures were selected because they are representative and desirable temperatures for washing and rinsing in mechanical dishwashing. Portions of 100 ml. of the mixed detergent solutions at the temperatures mentioned were titrated by adding standard calcium and magnesium chloride solutions from a burette until precipitation started to take place. The titration was made in a 500-ml. Erlenmeyer flask against a dull black background with indirect illumination through the test liquid. From these titrations calculations were made of the quantities of calcium and magnesium expressed in parts per million of calcium carbonate tolerated by the solution at the given temperature before precipitation occurred.

EXPERIMENTAL RESULTS

The study showed that the presence of other ions and temperature affects the sequestering ability of all three of the agents used. In general, it is easier to sequester both calcium and magnesium at lower temperatures. The data obtained have been plotted in a series of curves for each sequestering agent (figs. 1, 2, 3), and table 1 shows the sequestering values obtained with equal quantities of the phosphates and alkaline detergents at the two temperatures. These data show that in general it is harder to prevent the precipitation of calcium hardness than magnesium hardness by these agents. Also, as natural waters generally have hardness ratios of two parts calcium to one part magnesium, it may be stated that if a particular detergent mixture adequately controls the calcium hardness of the water, precipitation of the magnesium will also be prevented.

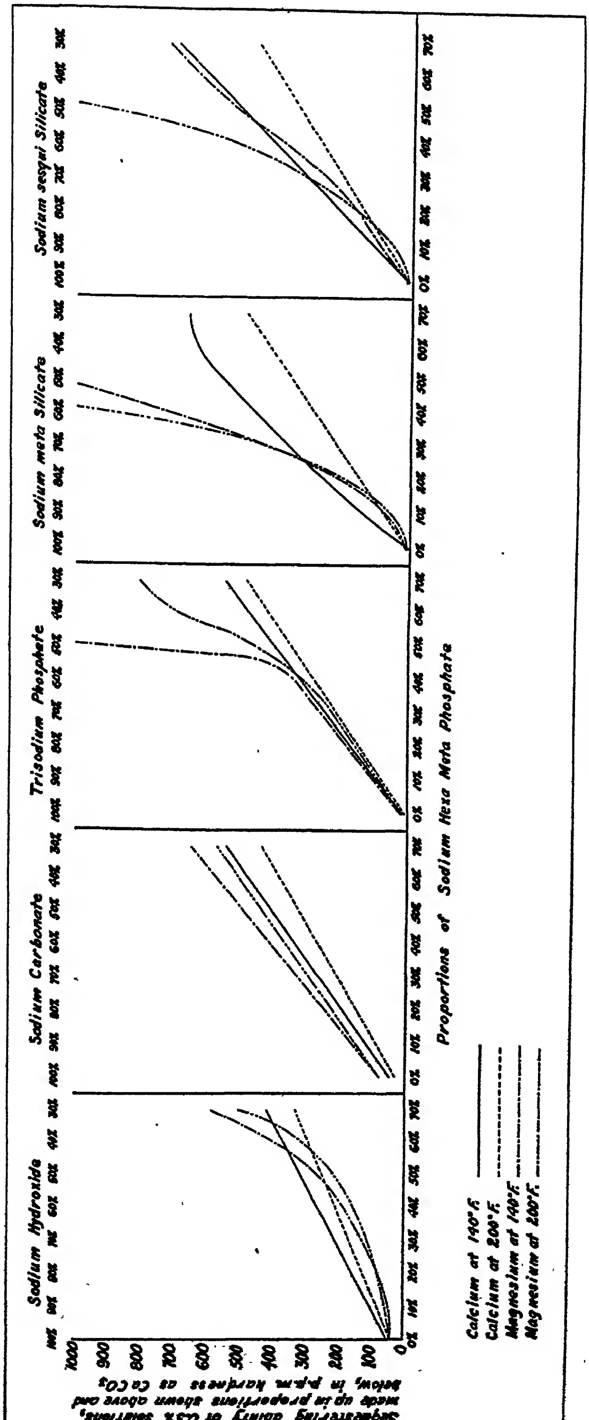
Sodium Hydroxide
Sodium Carbonate
Trisodium Phosphate
Sodium meta Silicate
Sodium sesqui Silicate
Sequestering ability of 0.3% solutions, made up in proportions shown above and below, in p.p.m. hardness as $CaCO_3$
1000
900
800
700
600
500
400
300
200
100
0
Proportions of Sodium Hexa Meta Phosphate
Calcium at 140°F.
Calcium at 200°F.
Magnesium at 140°F.
Magnesium at 200°F.

FIGURE 1.

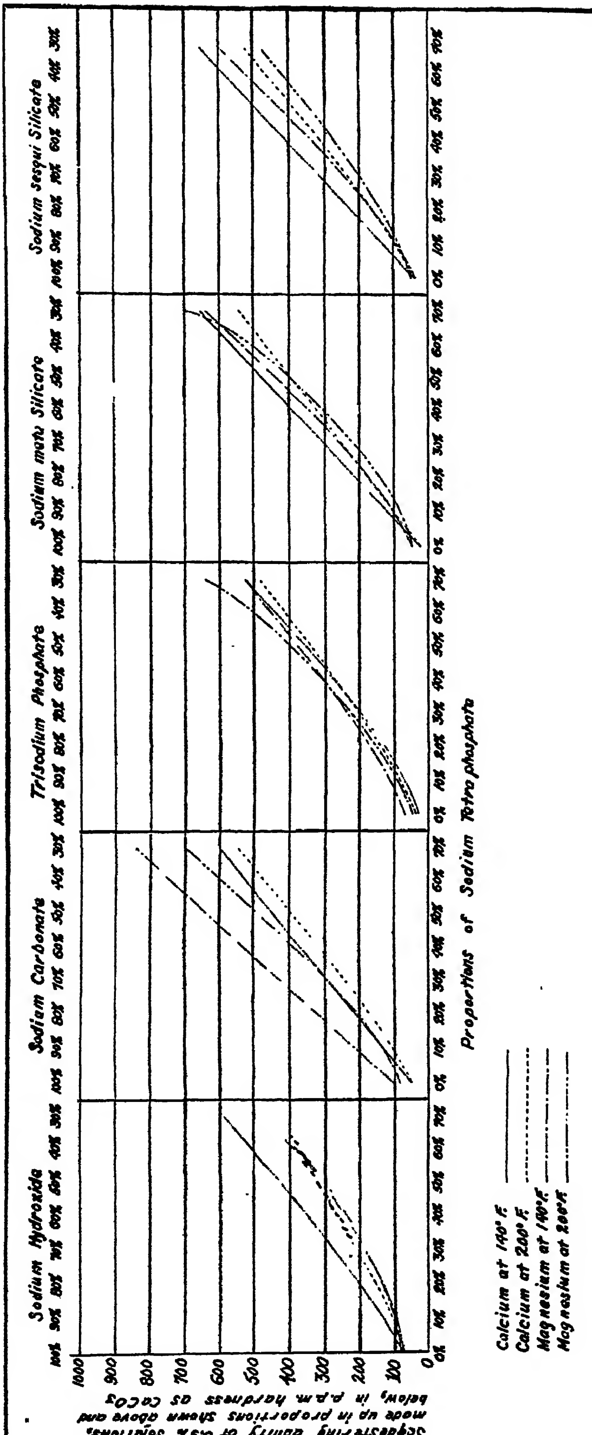
Sodium Hydroxide
Sodium Carbonate
Trisodium Phosphate
Sodium meta Silicate
Sodium Sesqui Silicate
Proportions of Sodium Tetra phosphate
Sequestering ability of 0.3% solutions, made up in proportions shown above and below, in p.p.m. hardness as CaCO3
Calcium at 140° F.
Calcium at 200° F.
Magnesium at 140° F.
Magnesium at 200° F.

FIGURE 2.

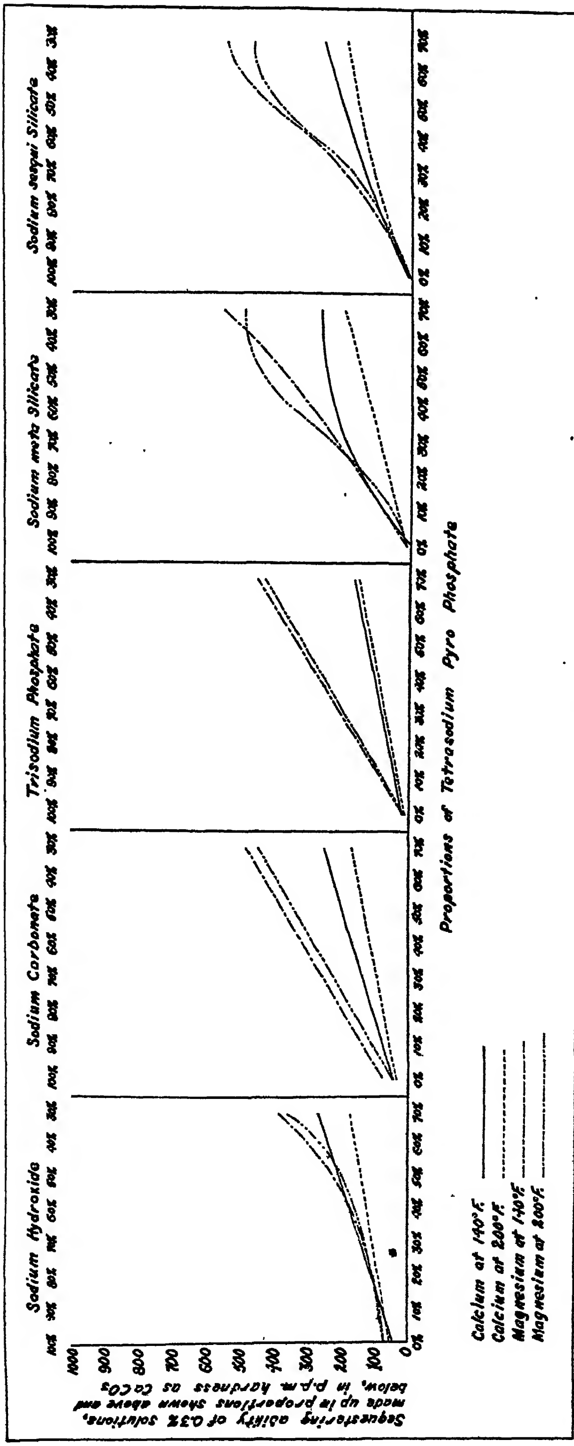
Sodium Hydroxide
Sodium Carbonate
Trisodium Phosphate
Sodium meta Silicate
Sodium sesqui Silicate
Proportions of Tetrasodium Pyro Phosphate
Sequestering ability of 0.3% solutions, made up in proportions shown above and below, in p.p.m. hardness as $CaCO_3$
0
100
200
300
400
500
600
700
800
900
1000
Calcium at 140°F.
Calcium at 200°F.
Magnesium at 140°F.
Magnesium at 200°F.

FIGURE 3.

Sodium hexametaphosphate [2] and sodium tetraphosphate [3] display almost equal sequestering ability for calcium. Sodium hexametaphosphate, in the presence of trisodium phosphate and the silicates, has somewhat better magnesium-sequestering ability than does sodium tetraphosphate. The latter phosphate has approximately the same degree of sequestering ability for both calcium and magnesium.

Of the three phosphates studied, tetrasodium pyrophosphate displays the poorest sequestering ability for calcium, its reactions with magnesium being comparable to those of sodium tetraphosphate.

The presence of other alkaline salts is a determining factor in the ease with which the hardness is controlled. Where sodium hexametaphosphate is used as the sequestering agent, the order in which sequestering ability increases for calcium in the presence of the five alkalies studied is as follows: Sodium hydroxide, sodium carbonate, trisodium phosphate, sodium sesquisilicate, and sodium metasilicate.

In the case of sodium tetraphosphate this order becomes: Trisodium phosphate, sodium hydroxide, sodium carbonate, and the silicates, both compounds having the same effect.

With tetrasodium pyrophosphate, increased sequestering ability occurs as follows: Trisodium phosphate, sodium carbonate, sodium hydroxide, sodium sesquisilicate, and sodium metasilicate. The order of sequestering ability can be checked easily by reference to table 1, which shows the sequestration values in 0.3-percent solutions

TABLE 1.—*Sequestering values for calcium and magnesium in parts per million of $CaCO_3$ of 0.3-percent solutions containing equal quantities of the stated phosphates and alkaline detergents at 140° and 200° F.*

Sequestration:	Polyphosphates	Alkalies				
		NaOH	Na_2CO_3	Na_3PO_4	Metasilicate	Sesquisilicate
Calcium at 140° F	$(NaPO_3)_6$	310	400	400	550	500
	$Na_6P_4O_{13}$	420	440	350	470	490
	$Na_4P_2O_7$	200	190	120	250	200
Calcium at 200° F	$(NaPO_3)_6$	250	320	350	350	330
	$Na_6P_4O_{13}$	330	380	340	390	380
	$Na_4P_2O_7$	140	130	110	140	150
Magnesium at 140° F	$(NaPO_3)_6$	260	490	840	1,000	510
	$Na_6P_4O_{13}$	290	630	370	430	420
	$Na_4P_2O_7$	220	360	320	360	400
Magnesium at 200° F	$(NaPO_3)_6$	210	430	450	>1,000	880
	$Na_6P_4O_{13}$	300	480	390	390	340
	$Na_4P_2O_7$	190	330	300	430	380

containing equal quantities of the phosphates and alkaline detergents at the elevated temperatures of the study.

[2] Product of Calgon, Inc., Pittsburgh, Pa.

[3] Product of Rumford Chemical Works, Rumford, R. I.

DISCUSSION

Dishwashing experiments conducted along with these tests, in which film build-up was studied, indicated that a large portion of film deposited on glassware forms during rinsing. If a detergent precipitates the water hardness instead of sequestering it, an adequate amount of detergent may be added to hard water to soften it by precipitation and still a good job of cleaning may result.

During the rinsing operation, however, the film of detergent remaining on the utensil at the time the rinse water comes into contact with it precipitates the hardness of the rinse water. This precipitation takes place in intimate contact with the utensil and adheres to the surface producing the hardness film.

From these indications it seems of importance to have an adequate quantity of sequestering agent incorporated in the detergent, to prevent precipitation at the start of the rinse. In this way the alkaline film may be rinsed from the utensil before a hardness film has a chance to form.

SUMMARY

The effectiveness of three sequestering agents in preventing the formation of hardness films on utensils during washing operations in solutions of alkaline detergents was studied. The sequestering agents included were sodium hexametaphosphate, tetrasodium pyrophosphate and sodium tetraphosphate. The alkaline detergents were sodium hydroxide, sodium carbonate, trisodium phosphate, sodium metasilicate, and sodium sesquisilicate. Experiments with various ratios of sequestering agent and alkaline detergent in 0.3-percent solutions at 140° and 200° F. showed that in general the sequestering ability was reduced at the higher temperature and that it was affected by the presence of other ions. The sequestration data obtained have been presented in a series of curves. In general, it was found easier to sequester magnesium than calcium. The effectiveness of sodium hexametaphosphate and sodium tetraphosphate in respect to calcium sequestration is about equal, while tetrasodium pyrophosphate is somewhat less effective. Tests in actual washing procedure indicated that precipitation of the hardness during the rinse is very critical in the formation of films on cleaned utensils. This makes essential the use of large proportions of these sequestering agents in detergent mixtures in order to prevent precipitation of water hardness on the utensil in the rinse.

INJURY RESULTING FROM USE OF AEROSOL BOMB [1]

By Dwight F. Metzler, *Passed Assistant Sanitary Engineer (R)*

The failure of an aerosol bomb, of the type used by the Army, resulted in a severe hand injury to the person using it. When the needle valve was opened three-quarters turn, it was blown out, allowing the mixture of pyrethrum, DDT, and Freon to escape. The operator placed his hand over the opening in an attempt to stop the flow, and rushed the bomb out of the dwelling. When he dropped it his hand was frozen in the shape in which it had been cupped over the bomb.

Examination of the hand showed injuries equivalent to a third-degree burn. An analysis of the blood indicated no toxic effect from the DDT. The appearance of the bomb revealed that in manufacture the drill had not been properly centered, and that no threads had been cut along one side of the sleeve housing the valve.

[1] From Federal Public Housing Authority, Region III, Chicago, Illinois.

DEATHS DURING WEEK ENDED MAR. 16, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 16, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	9,231	9,573
Average for 3 prior years	9,662	
Total deaths, first 11 weeks of year	113,120	107,039
Deaths under 1 year of age	592	662
Average for 3 prior years	683	
Deaths under 1 year of age, first 11 weeks of year	6,650	6,989
Data from industrial insurance companies:		
Policies in force	67,185,397	67,133,456
Number of death claims	15,229	15,439
Death claims per 1,000 policies in force, annual rate	11.8	12.0
Death claims per 1,000 policies, first 11 weeks of year, annual rate	11.4	10.9

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 23, 1946

Summary

The incidence of diphtheria increased during the week. The total of 368 cases is more than reported for any of the past 4 weeks and more than for the corresponding week of any other year since 1939. An aggregate of 263 cases occurred in the 13 States reporting currently more than 8 cases each, of which the 9 States showing increases are as follows (last week's figures in parentheses): New York 14 (9), Pennsylvania 21 (16), Indiana 14 (6), Illinois 54 (34), Maryland 13 (10), Kentucky 10 (4), Mississippi 13 (5), Louisiana 16 (7), California 25 (24). The total for the year to date is 4,611. The largest number for the corresponding period of the past 5 years, 3,814, occurred in 1942. In 1940 the figure for the period was 4,668.

A total of 34,300 cases of measles was reported for the current week, as compared with 29,812 last week and a 5-year median of 24,632. Of the current total, 19,055 cases, or about 56 percent, occurred in the Middle Atlantic and East North Central areas. The cumulative total is 186,541, as compared with a 5-year median of 184,225.

The total of 166 cases of meningococcus meningitis, as compared with 186 last week and a 5-year median of 225, is the smallest number reported so far this year. The cumulative total, 2,399, is less than reported for any corresponding period since 1942.

Of a total of 28 cases of poliomyelitis (the same number as reported for the corresponding week last year), as compared with 23 last week and 24 for the 5-year median, no State reported more than 2 cases except New York (5) and California (4). The total to date is 494 cases, as compared with 453 for the same period last year and a 5-year median of 311.

Of the total of 14 cases of smallpox reported for the week, 7 occurred in Washington State. A later report states that, up to March 26, 15 cases of the disease have occurred in Seattle and King County, the first case following exposure, on February 5, to a case in a soldier returned from the Orient. Up to March 27, 7 cases had been reported in San Francisco.

Deaths recorded for the week in 93 large cities of the United States totaled 9,569, as compared with 9,267 last week, 9,640 and 9,605 for the corresponding weeks, respectively, of 1945 and 1944, and a 3-year (1943–45) average of 9,747. The total for the year to date is 123,115, as compared with 117,103 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Mar. 23, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945	
NEW ENGLAND												
Maine	6	0	0	5	1	2	24	1	118	1	2	2
New Hampshire	0	2	0	2	------	1	4	------	18	0	1	0
Vermont	1	0	0	------	------	------	16	7	39	0	0	0
Massachusetts	3	5	1	------	------	------	761	143	782	6	2	8
Rhode Island	2	1	1	1	------	------	4	4	31	1	2	2
Connecticut	1	2	0	3	------	2	185	138	349	3	4	4
MIDDLE ATLANTIC												
New York	14	12	19	[1] 3	[1] 3	[1] 11	4,221	121	2,413	22	32	32
New Jersey	4	6	6	5	6	15	2,591	61	1,515	3	5	5
Pennsylvania	21	12	10	3	3	2	3,949	143	1,206	8	12	12
E. NORTH CENTRAL												
Ohio	18	11	6	4	10	16	571	39	634	6	14	7
Indiana	14	7	7	10	10	23	1,098	37	262	5	5	5
Illinois	54	8	14	30	1	35	1,802	91	1,092	9	10	10
Michigan [2]	11	10	6	1	------	6	3,032	86	904	2	11	11
Wisconsin	5	0	3	70	55	55	1,791	28	1,058	1	4	3
W. NORTH CENTRAL												
Minnesota	7	3	5	------	3	3	45	17	121	3	3	3
Iowa	5	12	3	------	------	------	133	31	239	6	0	0
Missouri	2	6	5	3	11	5	340	6	414	5	6	6
North Dakota	0	1	0	6	12	9	22	6	61	0	0	0
South Dakota	0	0	2	------	------	------	50	23	23	0	1	0
Nebraska	3	3	2	8	15	11	304	26	110	0	0	0
Kansas	4	1	3	2	2	5	1,121	23	760	2	5	5
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	44	29	29	1	2	1
Maryland [2]	13	3	3	7	2	6	453	80	196	5	3	5
District of Columbia	0	0	0	------	------	2	214	19	91	5	1	2
Virginia	5	4	4	193	442	480	687	85	692	8	10	10
West Virginia	6	1	3	------	8	20	86	51	280	3	6	2
North Carolina	14	7	8	------	------	63	482	46	1,028	0	9	9
South Carolina	3	6	3	539	260	515	433	22	259	0	0	2
Georgia	1	3	5	261	10	79	306	29	298	0	3	3
Florida	1	4	2	4	------	5	130	35	171	2	7	3
E. SOUTH CENTRAL												
Kentucky	10	5	3	47	------	19	596	9	106	5	6	5
Tennessee	6	6	3	33	50	74	283	135	218	5	8	8
Alabama	6	12	6	124	104	228	141	16	462	8	5	5
Mississippi [2]	13	4	2	------	------	------	------	------	------	1	8	6
W. SOUTH CENTRAL												
Arkansas	5	5	5	109	46	114	172	34	177	3	2	2
Louisiana	16	2	3	88	47	10	233	42	120	10	3	3
Oklahoma	8	5	5	125	68	141	182	44	74	1	0	1
Texas	40	20	37	1,504	1,021	1,049	1,867	650	1,359	8	5	5
MOUNTAIN												
Montana	1	0	1	------	22	17	26	11	53	1	1	0
Idaho	0	1	0	26	------	------	150	1	50	0	0	0
Wyoming	0	0	1	1	------	20	36	16	71	1	0	0
Colorado	8	4	5	29	14	19	637	16	266	0	0	0
New Mexico	2	5	1	4	3	15	9	4	79	0	0	0
Arizona	1	2	2	133	137	138	105	15	53	1	2	0
Utah [2]	0	0	0	1	29	29	655	116	116	1	0	0
Nevada	0	0	0	------	------	------	13	------	10	0	0	0
PACIFIC												
Washington	8	4	2	------	4	6	806	241	241	5	4	4
Oregon	1	36	1	------	16	30	403	52	144	0	1	1
California	25	31	23	93	14	91	3,087	1,226	1,226	9	20	20
Total	368	272	271	3,477	2,429	3,742	34,300	4,055	24,632	166	225	225
12 weeks	4,611	3,713	3,509	173,413	48,724	57,807	186,541	28,015	184,225	2,399	3,016	3,016

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Mar. 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945		Mar. 23, 1946	Mar. 24, 1945	
NEW ENGLAND												
Maine	0	0	0	33	97	20	0	0	0	0	0	0
New Hampshire	0	0	0	3	3	13	0	0	0	0	0	0
Vermont	1	1	0	2	17	10	0	0	0	0	0	0
Massachusetts	0	2	1	199	380	388	0	0	0	5	2	0
Rhode Island	0	0	0	3	19	16	0	0	0	0	0	0
Connecticut	0	0	0	62	107	81	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	5	5	1	684	891	587	0	0	0	0	5	5
New Jersey	1	2	0	135	220	220	0	0	0	0	0	1
Pennsylvania	2	2	1	451	797	603	0	0	0	2	6	5
EAST NORTH CENTRAL												
Ohio	2	0	0	409	447	319	0	1	1	3	1	2
Indiana	1	0	0	108	156	156	1	1	1	1	5	3
Illinois	1	1	0	224	482	482	0	1	1	1	1	1
Michigan [2]	0	0	0	148	299	283	0	0	0	0	0	2
Wisconsin	0	0	0	165	307	294	0	0	0	2	1	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	49	137	95	0	0	0	0	0	0
Iowa	0	0	0	67	120	120	2	1	0	0	0	0
Missouri	0	0	0	55	82	125	0	0	0	1	2	2
North Dakota	0	0	0	15	28	23	0	0	0	0	0	0
South Dakota	0	0	0	12	11	24	0	0	0	0	0	0
Nebraska	0	0	0	32	99	54	0	0	0	0	0	0
Kansas	0	1	1	74	87	96	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	9	15	15	0	0	0	0	0	0
Maryland [2]	0	0	0	103	291	107	0	0	0	0	0	0
District of Columbia	0	0	0	25	51	23	0	0	0	1	0	0
Virginia	0	1	0	121	149	55	0	0	0	0	0	1
West Virginia	0	0	0	30	54	42	0	0	0	0	2	2
North Carolina	0	2	0	51	111	26	0	0	0	2	1	1
South Carolina	0	0	0	14	6	8	0	0	0	0	0	1
Georgia	0	0	0	6	58	15	1	0	0	5	3	3
Florida	1	0	0	4	7	7	0	0	0	0	1	4
EAST SOUTH CENTRAL												
Kentucky	1	0	0	41	53	63	0	0	0	0	1	1
Tennessee	0	2	0	36	86	64	0	0	1	0	2	1
Alabama	1	1	1	25	14	16	0	0	0	0	1	1
Mississippi [2]	2	1	0	6	22	16	0	0	0	1	1	1
WEST SOUTH CENTRAL												
Arkansas	1	0	0	14	16	15	1	0	0	1	0	2
Louisiana	1	0	0	9	13	10	1	0	0	5	4	4
Oklahoma	0	0	0	18	16	17	0	0	1	1	2	1
Texas	1	4	4	61	94	59	0	0	0	6	3	6
MOUNTAIN												
Montana	1	0	0	10	9	22	0	0	0	0	0	0
Idaho	0	0	0	4	48	6	0	0	0	0	0	0
Wyoming	0	0	0	17	10	10	0	0	0	0	0	0
Colorado	0	0	0	43	71	57	0	0	0	0	0	0
New Mexico	1	0	0	17	23	10	0	0	0	0	5	2
Arizona	0	0	0	17	54	15	0	0	0	1	0	0
Utah [2]	0	0	0	47	30	42	0	0	0	1	0	0
Nevada	0	0	0	1	1	1	0	0	0	0	0	0
PACIFIC												
Washington	1	0	0	27	100	53	7	0	0	2	0	1
Oregon	0	0	0	17	48	19	0	0	0	0	1	1
California	4	3	3	174	388	200	1	0	0	2	0	3
Total	28	28	24	3,877	6,624	4,269	14	4	19	43	50	65
12 weeks	494	425	311	40,402	68,094	48,344	99	118	266	518	674	891

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 3; Georgia 1.

Telegraphic morbidity reports from State health officers for the week ended Mar. 23, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Mar. 23, 1946	Whooping cough: Week ended— Mar. 24, 1945	Whooping cough: Median 1941–45	Week ended Mar. 23, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	30	131	37								1
New Hampshire			3								
Vermont	41	19	19								2
Massachusetts	100	240	232		2						
Rhode Island	36	19	19		1						
Connecticut	65	50	57								
MIDDLE ATLANTIC											
New York	143	232	294	6	4						3
New Jersey	177	101	101	1							
Pennsylvania	138	197	211				1				8
EAST NORTH CENTRAL											
Ohio	48	173	173	1	1						2
Indiana	17	8	34	1					1		4
Illinois	64	55	86	2	1		1		2		1
Michigan [3]	119	100	199	4	3						5
Wisconsin	95	56	101						1		3
WEST NORTH CENTRAL											
Minnesota	5	16	38	1							13
Iowa	18	3	19								
Missouri	7	22	22			1			8		
North Dakota		1	8								
South Dakota	1	1	1								
Nebraska		3	27								
Kansas	19	38	38						1		7
SOUTH ATLANTIC											
Delaware	2	4	4								
Maryland [3]	9	50	50								4
District of Columbia	7	8	8								
Virginia	21	109	74			35					
West Virginia	31	23	23								
North Carolina	59	171	170	1					1	2	
South Carolina	75	46	57	4	8					1	
Georgia	11	19	19		7	25			3	6	3
Florida	11	22	20	2						7	1
EAST SOUTH CENTRAL											
Kentucky	20	18	68					0			
Tennessee	27	168	30						1		1
Alabama	6	14	37						1	5	4
Mississippi [3]									2	1	3
WEST SOUTH CENTRAL											
Arkansas	2	28	20	1					1		
Louisiana	2	2	4	2					2	9	2
Oklahoma	5	12	22								
Texas	194	261	261	8	225	18				11	19
MOUNTAIN											
Montana	2	4	8								1
Idaho	9	4	4								1
Wyoming	2	12	7								
Colorado	39	32	32								
New Mexico	11	2	8			4					
Arizona	17	34	34			17					
Utah [3]	15	27	44								1
Nevada											
PACIFIC											
Washington	28	18	63								2
Oregon	4	24	18	2				1			1
California	90	374	374	1	12		1			1	6
Total	1,822	2,951	3,685	37	264	100	3	1	24	43	98
Same week, 1945	2,951			35	202	118	15	0	8	38	91
Average, 1943–45	2,943			36	188	69	13	[4] 0	12	[4] 37	
12 weeks: 1946	21,802			459	3,459	1,312	97	5	251	576	823
1945	29,090			332	5,912	1,548	88	4	226	613	1,014
Average, 1943–45	32,741		[4] 47,025	324	3,575	937	114	[4] 4	185	[4] 515	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 16, 1946

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	2	0	2	0	4	0	0	18
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	4	0	0	0
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	5	0	------	0	183	1	18	0	38	0	0	23
Fall River	0	0	------	0	3	0	2	0	5	0	0	1
Springfield	0	0	------	0	14	0	0	0	6	0	0	3
Worcester	0	0	------	0	42	0	12	0	3	0	0	27
Rhode Island:												
Providence	2	0	1	0	5	0	0	0	5	0	0	30
Connecticut:												
Bridgeport	0	0	1	1	------	1	0	0	1	0	0	1
New Haven	0	0	------	0	90	0	2	0	2	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	------	1	221	1	6	0	20	0	1	11
New York	15	0	4	2	976	11	67	0	378	0	0	29
Rochester	0	1	------	0	409	0	2	0	14	0	0	1
Syracuse	0	0	------	0	293	0	1	1	12	0	0	1
New Jersey:												
Camden	0	0	------	0	70	0	1	0	0	0	0	8
Newark	0	0	1	0	760	0	3	0	16	0	0	14
Trenton	0	0	1	0	7	1	0	0	1	0	0	3
Pennsylvania:												
Philadelphia	0	0	5	4	985	3	25	0	60	0	1	15
Pittsburgh	0	0	2	3	3	2	5	0	8	0	0	------
Reading	0	0	------	0	538	0	4	0	3	0	0	13
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	1	1	118	1	9	0	20	0	0	2
Cleveland	2	0	3	1	29	2	8	0	31	0	0	6
Columbus	0	0	------	0	3	0	0	0	12	0	0	------
Indiana:												
Fort Wayne	1	0	------	0	5	0	2	0	1	0	0	------
Indianapolis	0	0	------	0	628	0	7	0	11	0	0	3
South Bend	0	0	------	0	------	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	1	0	0	0	4	0	0	1
Illinois:												
Chicago	1	0	4	0	987	5	34	0	76	0	0	50
Michigan:												
Detroit	10	1	------	1	1,470	1	7	0	38	0	0	------
Flint	1	0	------	0	7	0	5	0	2	0	0	------
Grand Rapids	0	0	------	0	97	0	0	0	4	0	0	1
Wisconsin:												
Kenosha	0	0	------	0	2	0	0	0	5	0	0	------
Milwaukee	0	0	1	1	669	2	5	0	30	0	0	20
Racine	0	0	------	0	12	0	0	0	1	0	0	1
Superior	0	0	------	0	2	0	0	0	1	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	1	13	0	2	0	3	0	0	3
Minneapolis	4	0	------	0	17	0	4	0	5	0	0	2
Missouri:												
Kansas City	0	0	------	0	167	1	11	0	2	0	0	------
St. Joseph	1	0	------	0	12	0	0	0	1	0	1	------
St. Louis	5	0	1	0	57	1	11	1	24	0	0	

City reports for week ended Mar. 16, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	2	0	------	0	57	0	4	0	13	0	0	2
Kansas:												
Wichita	0	0	1	0	47	0	4	0	6	0	0	4
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	16	0	1	0	1	0	0	------
Maryland:												
Baltimore	10	1	1	0	305	2	12	0	40	0	1	15
Cumberland	0	0	------	0	------	0	0	0	4	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	1	------
District of Columbia:												
Washington	0	0	------	0	179	5	10	0	30	0	1	2
Virginia:												
Lynchburg	0	0	------	1	6	0	1	0	0	0	0	2
Richmond	0	0	------	0	23	0	1	0	9	0	0	3
Roanoke	0	0	------	0	20	0	0	0	5	0	0	------
West Virginia:												
Charleston	0	0	------	0	1	0	0	0	2	0	0	------
Wheeling	0	0	------	0	5	0	1	0	0	0	0	7
North Carolina:												
Raleigh	0	0	------	0	48	0	0	0	0	0	0	1
Wilmington	0	0	------	0	17	0	0	0	0	0	0	1
Winston-Salem	0	0	------	0	16	0	2	0	4	0	0	15
South Carolina:												
Charleston	0	0	17	0	14	0	3	0	0	0	0	4
Georgia:												
Atlanta	0	0	11	0	2	0	6	0	3	0	0	------
Brunswick	0	0	------	0	1	0	0	0	0	0	0	------
Savannah	0	0	3	1	1	0	2	0	0	0	0	------
Florida:												
Tampa	0	0	------	0	31	0	7	0	1	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	1	1	30	1	8	0	5	0	0	3
Nashville	0	0	------	0	16	0	1	0	0	0	0	------
Alabama:												
Birmingham	0	0	6	0	9	0	1	0	1	0	0	2
Mobile	0	0	------	2	1	0	1	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	6	0	2	0	1	0	0	------
Louisiana:												
New Orleans	*18	0	11	1	5	5	*5	1	14	0	1	------
Shreveport	0	0	------	0	------	0	4	0	1	0	0	------
Texas:												
Dallas	2	0	------	0	5	0	6	0	5	0	0	------
Galveston	0	0	------	0	5	0	3	0	0	0	1	------
Houston	5	0	------	0	------	0	3	2	0	0	0	------
San Antonio	1	0	4	5	27	1	3	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	1	1	0	0	0	------
Great Falls	1	0	------	0	1	0	3	0	1	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	5	0	0	0	0	0	0	------
Colorado:												
Denver	2	0	4	0	256	1	10	0	10	0	0	14
Pueblo	1	0	------	0	5	0	1	0	2	0	0	1
Utah:												
Salt Lake City	0	0	------	1	91	0	2	0	2	0	0	6

*Including monthly report from Charity Hospital, New Orleans (data excluded in computing rates).

City reports for week ended Mar. 16, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0		1	211	1	4	0	11	4	1	7
Spokane	0	1		0	138	0	2	0	0	0	0	1
Tacoma	0	0		0	24	0	0	0	1	0	0	7
California:												
Los Angeles	2	0	17	0	289	3	3	0	58	0	0	13
Sacramento	0	0	1	1	140	1	3	0	1	0	0	1
San Francisco	1	0	3	0	282	2	8	1	13	0	1	4
Total	78	4	105	30	11,232	55	378	7	1,098	4	10	407
Corresponding week, 1945	69		46	27	861		454		1,906	0	11	655
Average, 1941-45	65		216	[1] 39	[2] 6,250		[1] 481		1,758	1	13	799

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia, 1.
Dysentery, amebic.—Cases: New York, 5; Detroit, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: Baltimore, 1; Charleston, S. C., 3; Los Angeles, 1; San Francisco, 1.
Dysentery, unspecified.—Cases: San Antonio, 3.
Leprosy.—Cases: Tampa, 1.
Tularemia.—Cases: Winston-Salem, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: New York, 1; New Orleans, 19; Los Angeles, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1943, 33,776,800)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	20.0	0.0	5.7	2.9	971	5.7	103.1	0.0	195	0.0	0.0	304
Middle Atlantic	7.4	0.5	6.0	4.6	1,973	8.3	52.8	0.5	237	0.0	0.9	44
East North Central	9.8	0.6	5.5	2.5	2,471	6.7	47.2	0.0	146	0.0	0.0	52
West North Central	27.8	0.0	4.6	2.3	857	4.6	83.4	2.3	125	0.0	2.3	28
South Atlantic	16.3	1.6	52.3	3.3	1,120	11.4	75.2	0.0	162	0.0	4.9	82
East South Central	0.0	0.0	41.3	17.7	331	5.9	64.9	0.0	35	0.0	0.0	30
West South Central	32.4	0.0	43.0	17.2	138	17.2	85.0	8.6	63	0.0	5.7	3
Mountain	31.8	0.0	31.8	7.9	2,843	7.9	135.0	7.9	119	0.0	0.0	167
Pacific	7.9	1.6	33.2	3.2	1,714	11.1	31.6	1.6	133	6.3	3.2	52
Total	12.3	0.6	16.3	4.6	1,739	8.5	59.4	1.1	170	0.6	1.5	63

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

Smallpox has recently appeared on the West Coast in San Francisco and Seattle, apparently introduced from the Orient in both instances. The first case in San Francisco occurred in a patient who arrived from Japan on December 28, the eruption appearing on December 29. Up to March 27 a total of 7 cases had been reported in San Francisco.

The first case in Seattle was reported with onset on February 19, following exposure, on February 5, to a case in a soldier who had returned from the Orient. Up to March 26, 15 cases and 2 suspect cases, traceable to the original cases, had been reported in Seattle and King County.

Intensive immunization is reported under way in both cities.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (*rodent*).—A rat found on January 17, 1946, in District 15A, Hamakua Mill area, Honokaa, Hamakua District, Island of Hawaii, T. H., was proved positive for plague on January 28, 1946.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 23, 1946.—During the week ended February 23, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		8	4	105	322	47	23	36	103	648
Diphtheria		4	2	25	5	7				4
Dysentery, bacillary				4	1				7	1
Encephalitis, infectious					1					1
German measles		3		20	28			7	10	68
Influenza		132			104	3			158	397
Measles		157	22	482	1,716	1	4	27	47	2,456
Meningitis, meningococcus					3				1	4
Mumps			4	36	322	47	10	38	125	582
Scarlet fever		14	8	33	96	13	2	15	15	196
Tuberculosis (all forms)		1	2	126	48	7	3	25	89	301
Typhoid and paratyphoid fever		5		7	6			3		21
Undulant fever			1		1					2
Venereal diseases:										
Gonorrhea		20	7	57	156	33	41	46	71	431
Syphilis		7	6	145	129	7	10	12	36	352
Other forms				1						1
Whooping cough		11		58	68	2		6		145

FINLAND

Notifiable diseases—January 1946.—During the month of January 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Actinomycosis	1	Mumps	872
Cerebrospinal meningitis	15	Ophthalmia neonatorum	2
Chickenpox	1,541	Paratyphoid fever	203
Conjunctivitis	19	Pneumonia (all forms)	2,758
Diphtheria	1,553	Poliomyelitis	25
Dysentery, unspecified	11	Puerperal fever	41
Gastroenteritis	2,437	Rheumatic fever	334
Gonorrhea	1,736	Scabies	6,156
Hepatitis, epidemic	1,000	Scarlet fever	299
Influenza	1,316	Syphilis	671
Laryngitis	32	Typhoid fever	94
Malaria	1	Vincent's angina	20
Measles	61	Whooping cough	1,015

POLAND

Principal communicable diseases.—UNRRA reports new cases of certain communicable diseases in Poland during January 1946 as follows: Diphtheria, 2,190; scarlet fever, 771; typhoid fever, 6,624; typhus fever, 1,066.

The Ministry of Health estimates that there are 1,200,000 cases of active tuberculosis in Poland; that 70 percent of hospital effectiveness has been destroyed by war; and that there are only about 6,000 physicians in the entire country as compared with 13,000 before the war.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Smallpox

Morocco (French).—For the period March 1–10, 1946, 127 cases of smallpox were reported in French Morocco. Regions reporting the highest incidence are: Agadir and frontier districts, 13; Casablanca, 35; Fez, 2; Marrakech, 55; Meknes, 9; Oujda, 4; Rabat, 9.

Typhus Fever

Belgian Congo.—For the week ended March 2, 1946, 96 cases of typhus fever were reported in Belgian Congo.

Egypt.—For the week ended February 16, 1946, 81 cases of typhus fever with 4 deaths were reported in all of Egypt.

Eritrea.—For the week ended March 2, 1946, 26 cases of typhus fever were reported in Eritrea.

Guatemala.—For the month of January 1946, 76 cases of typhus fever with 13 deaths were reported in Guatemala. Departments reporting the highest incidence are: Huehuetenango, 20 cases, 5 deaths; Totonicapan, 16 cases, 1 death; Chimaltenango, 15 cases, 3 deaths; Quezaltenango, 15 cases, 3 deaths.

Morocco (French).—For the period March 1–10, 1946, 195 cases of typhus fever were reported in French Morocco. Regions reporting the highest incidence are: Casablanca, 72; Fez, 24; Marrakech, 23; Meknes, 42; Oujda, 2; Rabat, 32.

Turkey.—For the week ended March 16, 1946, 88 cases of typhus fever were reported in Turkey, including cases reported in ports as follows: Icel, 1; Istanbul, 6; Zonguldak, 1.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROT, *Chief of Division*

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Public Health Reports

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Public Health Reports

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A STATISTICAL STUDY OF 500 PSYCHOPATHIC PRISONERS [1]

By HULSEY CASON, *Psychophysiologist*, and M. J. PESCOR, *Medical Director*, *United States Public Health Service*

This is a report prepared from information contained in the clinical records of 500 prisoners received at and subsequently discharged from the Medical Center for Federal Prisoners located at Springfield, Mo. These prisoners were received by transfer from other Federal penal and correctional institutions primarily because they were behavior problems at the referring institutions, and therefore proper subjects for admission to the special unit built at the Medical Center to accommodate such persons. At one time or another all 500 subjects had been given a diagnosis of constitutional psychopathic inferiority (C. P. I.), or, to use the more common term, psychopathic personality.

Almost half (48 percent) of these psychopathic prisoners came from penitentiary-type institutions, 35 percent from reformatories, 2 percent from the National Training School for Boys, and the rest from a miscellaneous assortment of other Federal correctional institutions. Many of them had been in two or more Federal institutions before they came to Springfield.

The special unit for psychopaths at the Medical Center was opened on July 2, 1940. The subjects used in the present study represent those who were discharged from the institution during the period July 2, 1940, to December 31, 1944, inclusive. Very conveniently the number came out exactly 500. The discharges rather than the admissions were purposely selected in order to get some follow-up data on postmural antisocial activity.

The value of statistical presentation is greatly enhanced if com-

[1] From the Bureau of Medical Services, Medical Center for Federal Prisoners, Springfield, Mo.

parison can be made with other data of a similar character. In the present instance we were interested in how the subject group differed from male prisoners in all Federal penal and correctional institutions and how it differed from the male civilian population of comparable age. Since it was not possible to get satisfactory data on discharged Federal prisoners, use was made of the admission data on male prisoners received in Federal institutions during the years 1941, 1942, 1943, and 1944 (*1*, *2*, *3*, *4*). Data concerning the civilian population were obtained from the Bureau of the Census Reports for 1940, after making the necessary corrections for sex and age (*5*). Religious data for the civilian population were obtained from the World Almanac and Book of Facts based on a 1936 church census (*6*). The Selective Service report for 1943–44 yielded some information about physical defects (*7*).

Utilizing these sources of information, it was possible to compare psychopathic prisoners with Federal prisoners for the following factors: Age, race, nativity, marital status, current offense, and current sentence. It was likewise possible to compare the psychopathic prisoners with civilians for the following factors: Age, race, nativity, marital status, education, occupation, religion, physical defects, and population of residence.

DEMOGRAPHIC DATA

These data are the general type of information contained in police blotters or obtained in census enumerations. It is fairly reliable since it is not usually confidential except in the case of women who may wish to conceal their ages. In the present instance the study deals entirely with the male sex, and the exception is not applicable. As far as the cases in this study are concerned, the occupational history is the least reliable because in most instances the information was obtained from the prisoners themselves or from their relatives. The educational record is also not too accurate, for the same reason. Prisoners are inclined to exaggerate their educational and occupational attainments.

Age.—Comparative ages for psychopathic prisoners, all Federal prisoners, and civilians are presented in table 1.

TABLE 1.—*Comparative ages of male psychopathic prisoners, Federal prisoners, and civilians*

Age	Psychopaths	Federal prisoners	Civilians	Age	Psychopaths	Federal prisoners	Civilians
	Percent	*Percent*	*Percent*		*Percent*	*Percent*	*Percent*
15–19	7	8	13	40–49	6	15	17
20–23	37	17	9	50 and over	1	9	28
24–29	32	22	13	15–39	93	76	55
30–34	12	16	10	Median years	24.8	30.8	36.9
35–39	5	13	10				

The median age given for Federal prisoners is the age on admission, whereas the median age given for psychopathic prisoners is the age on discharge. Since the latter served a median of 2.4 years on their sentences, it follows that the median age on admission for the psychopathic prisoners is 22.4 years. At any rate, with or without this correction, it is apparent that there is a definite tendency for Federal prisoners to come from the younger age groups of the civilian adolescent and adult population. This tendency is unmistakable in the case of psychopathic prisoners. A definite relationship exists between age and criminal psychopathy. Something happens to psychopathic prisoners as they become older. They may reform completely, they may become model prisoners, or they may die young. At any rate, the age factor certainly deserves further investigative effort.

Nativity.—Table 2 shows the results on the nativity of psychopathic prisoners, Federal prisoners, and civilians.

TABLE 2.—*Nativity of male psychopathic prisoners, Federal prisoners, and civilians*

Nativity	Psychopaths	Federal prisoners	Civilians
	Percent	*Percent*	*Percent*
Native born	96	84	95
Foreign born	4	16	5

The percent of Federal prisoners who are foreign-born is three times the percent of foreign-born civilians. This is accounted for in a large measure by foreigners who violate immigration laws. However, there is no significant difference between civilians and psychopathic prisoners in this respect. As a matter of fact, 87 percent of the psychopaths were native-born and also had native parents. Criminal psychopaths are a native product and not a foreign importation.

Race.—Racial distribution for the three groups is presented in table 3.

TABLE 3.—*Distribution according to race of male psychopathic prisoners, Federal prisoners, and civilians*

Race	Psychopaths	Federal prisoners	Civilians
	Percent	*Percent*	*Percent*
White	84	77	89
Negro	13	20	10
Other	3	3	1

The proportion of nonwhite individuals among Federal prisoners is about two times the proportion of nonwhite individuals among civilians. However, the percent of nonwhite psychopaths is lower than the percent of nonwhite Federal prisoners. Eighty-three per-

cent of the white psychopathic prisoners stemmed from Nordic ancestry, 5 percent from Latin, 4 percent from Slavic, 2 percent from Semitic, and 6 percent from mixed ancestry.

Marital status.—Table 4 shows the distribution according to marital status for the three groups, ages 15 to 39.

TABLE 4.—*Distribution according to marital status for male psychopathic prisoners, Federal prisoners, and civilians, in the age group 15 to 39*

Marital status	Psychopaths	Federal prisoners	Civilians
	Percent	*Percent*	*Percent*
Single	72	44	51
Common-law	5		
Married	7	44	47
Divorced or separated	16	10	[1] 1
Widowed		2	1

[1] Includes only the divorced.

It is rather odd that there should be fewer single men among Federal prisoners than among civilians. Aside from that the results are what one would expect. There is a higher proportion of unsuccessful marriages among Federal prisoners and psychopathic prisoners than among civilians. Since the psychopaths are younger, it is natural that there should be a high percentage who had never married. Furthermore, psychopaths are not willing to accept the responsibilities of marriage, as indicated by the high percentage of failures, 70 percent of the marriages ending in divorce or separation.

Population of residence.—Sixty-nine percent of the psychopathic prisoners, prior to the age of 16, lived in communities of 5,000 or more population; 15 percent in rural nonfarm communities; 14 percent on farms; and 2 percent in institutions principally. On the other hand, 57 percent of the civilians lived in communities of 2,500 or more population; 20 percent in rural nonfarm communities; and 23 percent on farms. Even with the disparity in population standards, 5,000 as against 2,500, the results show a strong tendency for psychopathic prisoners to come from urban areas. Here is another factor which deserves further investigation. Do psychopaths tend to migrate to cities, or do cities produce psychopaths?

Education.—Two percent of the psychopathic prisoners had had no formal education; 12 percent attended one to four grades; 51 percent, five to eight grades; 31 percent, some high school; and 4 percent attended college for some period of time. Comparable figures for the civilian population are: 1 percent, no education; 6 percent, one to four grades; 36 percent, five to eight grades; 46 percent, one or more years of high school; and 11 percent, one or more years of college. The median grade for the psychopathic prisoners was found to be 7.7, and for the civilians 9.7. The fact that psychopathic

criminals are not as well educated as civilians may be due to lack of opportunity, or more likely, to indifference to education.

Occupation.—Comparison of psychopathic prisoners with civilians, from the standpoint of occupation, reveals only two essential differences. Whereas civilians show 14 percent who are classified as managers and officials, psychopathic prisoners show none in this category. On the other hand, 60 percent of the psychopathic subjects were classed as laborers or operatives, that is, unskilled or at best semiskilled laborers, in contrast to 33 percent of the civilians so classified. This is based on the number of psychopathic prisoners who gave an occupation. Actually 10 percent of the total number had never worked, and an additional 13 percent were engaged in illegal occupations principally. This is simply another indication of the irresponsibility of psychopaths.

Religion.—As a general rule, the psychopathic prisoners do not take religion seriously. Eighteen percent had no religious preference; and of those who did, 62 percent claimed that they had been brought up in the Protestant faith, 35 percent in the Catholic faith, and 3 percent in the Jewish faith. The church census for 1936 uncorrected for sex and age, shows the following distribution: Protestant, 56 percent, Catholic, 36 percent, and Jewish, 8 percent. These differences are too small to be of any significance.

ANTISOCIAL HISTORY

The antisocial activities of prisoners are accorded a great deal of prominence in their clinical records. Not only is the history of delinquency obtained by several institutional officials, but verified information is also secured from reports submitted by the Federal Bureau of Investigation, court records, police reports, probation officers' reports, social service agencies, and to a lesser extent from relatives. Major offenses resulting in penitentiary sentences are not likely to escape notice, but minor offenses punishable by fines or short jail terms may be overlooked.

Current offense.—Psychopathic prisoners show a decided penchant for stealing cars, 39 percent of the subjects having been committed for violation of the National Motor Vehicle Theft Act, in contrast to 9 percent of all Federal prisoners convicted for violating the same act. Apparently there is some significant relationship between car thievery and criminal psychopathy. It is possible that youth may be a factor, since the median age on admission for all Federal prisoners convicted of car stealing is 22.8 years, which is almost identical with the median age of 22.4 years, the admission age for psychopathic prisoners. At any rate, it would be worth while to investigate this relationship more fully.

The next highest in frequency of offenses among psychopathic prisoners is sodomy, 13 percent having been charged with that offense. All of these were military court-martial cases. Sodomy cases account for 1 percent of the offenses committed by all Federal prisoners. The present administrative policy is to concentrate homosexual individuals at the Medical Center as much as possible, rather than to keep them in the other penal and correctional institutions.

There are two other differences between the groups which are worth mentioning. Eighteen percent of Federal prisoners were convicted of violating liquor laws, but only 2 percent of the psychopathic prisoners were convicted of similar offenses. Likewise, 17 percent of the Federal prisoners ran afoul of the Selective Service Act, in contrast to 3 percent of the psychopathic prisoners.

Current sentence.—The average sentence imposed on psychopathic prisoners for their current offense was 55.2 months, in contrast to 27.6 months for Federal offenders. The median sentences were 43.2 and 15.6 months, respectively. The biggest difference lies in sentences of 1 year and 1 day, or less, only 4 percent of the psychopathic prisoners having such sentences, in contrast to 42 percent of all Federal offenders. On the other hand, 27 percent of the psychopathic subjects had sentences of 5 to 10 years, as opposed to 7 percent of all the Federal prisoners. Evidently courts are not too kindly disposed toward psychopaths. As an additional point of interest, 20 percent of the psychopathic subjects were serving two or more sentences either concurrently or consecutively, and another 9 percent were parole or conditional release violators for which they had to serve time in addition to that imposed by the new sentence.

First arrest.—There is general agreement that criminal psychopaths get into trouble with the law at an early age, and the current findings are no exception. The median age at the time of the first arrest was 16.9 years, and this figure would undoubtedly have been considerably lower if more complete data had been available. Fifteen percent of the psychopathic criminals in this study had a police record before the age of 13. The bulk of the first arrests were for crimes against property (47 percent), next came truancy and juvenile delinquency (13 percent), and third, sexual offenses (12 percent). Fifty-five percent were committed to jail or to some type of penal and correctional institution after their first known arrest, 26 percent were dismissed, and only 13 percent were placed on probation. The rather small number placed on probation is surprising.

Ostensible reason for antisocial activity.—The word ostensible is used purposely. No one knows why psychopaths commit crimes, least of all themselves. However, the reasons as elicited by the examining psychiatrists, together with percentage distributions, are presented for what they are worth: Faulty upbringing, poor discipline, or

vicious home, 50 percent; abnormal personality organization, 37 percent; bad companions, 5 percent; economic distress, 3 percent; ignorance of the law, 3 percent; and alcoholic intoxication, 2 percent.

Principal antisocial activity.—Apparently the subjects have little respect for property. Sixty-two percent committed crimes against property as their major antisocial activity, 17 percent indulged in illegal sexual activities, 7 percent preferred crimes against the person, and the rest specialized in violating laws of public policy, postal laws, revenue and immigration laws. Larceny requires less ingenuity than being a successful counterfeiter or confidence man. This may account for the preponderance of simple theft among psychopaths. The aggressiveness and "assaultiveness" of some psychopathic prisoners would lead one to suspect a greater percentage of crimes of violence than shown by the results.

Total number of commitments.—One usually thinks of psychopathic prisoners as confirmed recidivists. Yet 19 percent of our present group of subjects were first offenders, 22 percent had no previous record of commitments under sentence of 1 year or less, and 46 percent had no previous record of commitments under sentence of more than 1 year. Nevertheless, considering the group as a whole, each inmate averaged 3.8 commitments under sentence of 1 year or less, and 2.0 commitments under sentence of 1 year or more, including the current commitment. Expressed in medians, the figures are 3.1 and 1.7, respectively. Compared with all Federal offenders, the psychopathic prisoners show a much higher proportion of recidivists—81 percent compared with 49 percent. Prior to being admitted to the Medical Center, 37 percent of the subjects had at one time or another been inmates of juvenile institutions, 50 percent, of jails, and 98 percent, of penitentiaries or adult penal institutions. Twenty percent of the subjects had been in all three types of institutions, juvenile, jail, and adult penal. In other words, our subjects had had ample opportunity for rehabilitation before coming to Springfield.

OTHER PERSONAL DATA

The information under this heading is usually obtained by the psychiatrist and a representative of the institutional social service department; and verifications, if any, generally come from relatives and social service agencies. Some of the information is quite subjective in character, and therefore not too reliable.

Adjustment before the age of 16.—Thirty-nine percent of the subjects were considered obedient and well-behaved as children. The figure is undoubtedly too high because most parents are reluctant to admit the faults of their children. Another 22 percent were described as obedient, but inclined to get into mischief or trouble. Thirty-one

percent were admittedly headstrong, willful, and difficult to manage. No adequate information could be obtained on 6 percent, and 2 percent were brought up principally in institutions.

Economic status last year not in custody.—Apparently crime does not pay as far as the present subjects are concerned. Twenty-six percent lived at home, dependent upon their parents, 46 percent barely made a living, and only 28 percent were in comfortable economic circumstances. None were well-to-do.

Sexual history.—Sixty percent of the subjects admitted heterosexual experiences only, 17 percent both heterosexual and homosexual, 14 percent homosexual experiences only, and 9 percent of the subjects did not give an adequate enough history for classification. Of the pure homosexuals, 7 percent took the active male role only, 71 percent the female inactive role only, and 22 percent assumed both roles. Of the bisexual individuals, 39 percent preferred the male role in homosexual relationships, 33 percent the female role, and 28 percent either role. In other words, 50 percent of all individuals who admitted homosexual experiences preferred the female role, 25 percent the male role, and 25 percent were satisfied either way.

By including common-law relationship with the single, 77 percent of the subjects had never been married. Of those who had been married, 64 percent had no children, 23 percent had one child, 11 percent, two children, and only 2 percent three or more children. The reproduction rate for married psychopathic prisoners is, therefore, less than one child per person. If there is anything to heredity, the psychopathic strain may be eliminated eventually.

Habits.—Twenty-nine percent admitted excessive indulgence in alcohol, 27 percent had a definite history of nomadism, 27 percent were lazy and shiftless, 4 percent gave a history of drug addiction, and 4 percent gave a history of excessive gambling. No definite information about habits was available in 37 percent of the cases. One would expect a higher percentage of alcoholics than indicated above, likewise a higher percentage of gamblers. Undoubtedly a more exhaustive inquiry would change the picture considerably.

Military history.—Sixty-five percent of the subjects had no military experience, 20 percent had peacetime military experience only, 12 percent were in military service during World War II, and 3 percent had other types of military experiences. Of those who had military experience, only 18 percent received an honorable discharge, and 82 percent received a discharge other than honorable. One can readily see why the military authorities should avoid the recruitment of psychopaths. They do not react at all well to regimentation.

Past medical history.—Thirty-three percent of the psychopathic prisoners gave no history of unusual or permanently disabling diseases, 47 percent had the usual diseases of childhood with no sequelae,

6 percent had acute infectious diseases with sequelae, 3 percent received injuries resulting in some permanent damage, and 11 percent suffered chronic disabling diseases. Twenty-one percent gave a history of gonorrhea, 7 percent of syphilis, and 7 percent of both syphilis and gonorrhea. In other words, 65 percent denied venereal disease of any kind. One would expect a higher incidence, at least of gonorrhea, than was reported, despite the fact that a substantial number of the subjects were homosexuals.

Even psychopaths hesitate to admit mental disease. Therefore, it is not surprising that 82 percent of the subjects denied any mental disease. Five percent gave a history of nervous breakdown, unspecified, 3 percent of epilepsy, and 10 percent of frank psychoses. If verified information could be obtained, the percentage of mental abnormality would be correspondingly higher.

FAMILY HISTORY AND RELATIONSHIPS

Subjective information regarding family history is not at all easy to procure. For some reason an individual may readily admit that he himself is a blackguard, but he will tend to conceal any detrimental facts about his ancestry. Therefore, most of the data have to be gleaned from verified sources of information, principally letters from relatives. The mothers reveal the skeletons in the paternal closet, and the fathers disclose the darker side of the maternal ancestry.

Psychopathic determinants.—No information could be obtained in 62 percent of the cases concerning psychopathic determinants in the parents and grandparents. Alcoholism occurred in 21 percent of the families; criminalism in 13 percent; nervous breakdown, unspecified, in 8 percent; insanity in 5 percent; and feeble-mindedness in 2 percent. More than likely a tainted heredity is present in more than 50 percent of the subjects, if adequate information could be obtained.

Continuity of home.—Only 35 percent of the subjects came from a home intact up to the time they became 18 years of age. Comparable data are not available for the civilian population. Nevertheless, the high percentage of psychopaths coming from disrupted homes suggests some relationship between the continuity of the home and psychopathy. At least it warrants further investigation. The disruption of the home occurred for the following reasons: Death of mother, 6 percent; death of father, 11 percent; death of both parents, 4 percent; separation or divorce of parents, 18 percent; reared by various relatives, 11 percent; brought up in foster homes, 10 percent; brought up in an orphanage, 2 percent; and other conditions, 3 percent.

Economic status of parents.—It is surprising that in 43 percent of the cases the parents were in comfortable economic circumstances, and in

5 percent the parents were well-to-do. Thirty-seven percent of the parents were in marginal economic circumstances, and 15 percent submarginal, if not actually dependent. Apparently the continuity of the home is a more important factor than the economic status of the parents, as far as criminal psychopathy is concerned.

Familial likes and dislikes.—In 14 percent of the cases there existed an unusual attachment to the mother or stepmother, and in 2 percent of the cases an unusual attachment to the father or stepfather. On the other hand, 19 percent of the subjects expressed an unusual dislike for their fathers or stepfathers, 5 percent an unusual dislike for their mothers or stepmothers, and 5 percent an unusual dislike for both parents. Perhaps, by the use of psychoanalytic technique, these factors could be more fully explored as to their relationship to psychopathic criminality.

Sibling constellation.—Fifteen percent of the cases were only children; 21 percent, the oldest of the siblings; 22 percent, the youngest; and 42 percent, intermediate. The sibling position probably has little to do with the presence or absence of psychopathic tendencies.

INTRAMURAL RECORDS

Under this heading are included data of an objective character compiled from examinations, observations, and reports submitted by the hospital personnel. Some errors also creep into this type of information, but in general it is more reliable than subjective information.

Intelligence.—The distribution of the subjects according to intelligence is as follows: Very superior (I. Q. 120 and over), 7 percent; bright normal (I. Q. 110–119), 17 percent; average (I. Q. 90–109), 44 percent; dull normal (I. Q. 80–89), 17 percent; borderline (I. Q. 70–79), 7 percent; high-grade moron (I. Q. 55–69), 6 percent; low-grade moron (I. Q. 40–54), 2 percent. The mean I. Q. is 97, and the median I. Q. is 102. This confirms the observation frequently made, that psychopaths possess normal intelligence. It will be noted that a small percentage of the subjects were intellectually classified as morons. Some objection may be made to the inclusion of morons among psychopaths. However, the individuals in question displayed the typical behavior of psychopaths at the referring institutions, and as an administrative convenience they were transferred to the psychopathic unit at the Medical Center.

As a matter of fact, there is no reason why psychopathy and feeblemindedness cannot coexist. The outstanding characteristic of a psychopath is his lack of capacity for becoming a socialized human being. This suggests that we are dealing with a deficiency type of disorder analogous to that found in the feeble-minded person. It fits in with Thorndike's theory that there are three types or aspects of intelligence (*8*). First is the abstract which enables us to learn

academic subjects like reading, writing, mathematics, philosophy, and so on. Second is the concrete which enables us to do things with our hands, to acquire manual skill, and also artistic skill in painting, sculpture, or playing a musical instrument. Third is the social which enables us to live with our fellow men in at least a semblance of law and order. It is in social intelligence that the ordinary psychopath is found wanting. The feeble-minded psychopath is simply deficient in all three types of intelligence.

Psychiatric classification.—Although all the subjects at one time or another were considered psychopathic personalities, the final diagnoses were made as follows: Psychopathic personality with asocial and amoral trends, 42 percent; with pathologic sexuality, 32 percent; with emotional instability, 16 percent; mental deficiency, 5 percent; psychosis, 4 percent; and other, 1 percent. In other words, 90 percent were uncomplicated cases of psychopathic personality, and 10 percent had the complicating feature of a psychosis or mental deficiency added to psychopathic traits.

Physical disabilities.—Eighty-nine percent of the subjects had no physical defects, or had only minor defects, and were capable of normal physical exertion; 9 percent had chronic diseases or physical disabilities for which hospitalization was not needed, and 2 percent had chronic diseases necessitating hospitalization.

By Selective Service standards, all the subjects would be rejected for military service on the basis of the psychiatric classification. However, if physical defects alone are considered 26 percent of the psychopaths would be rejected. According to the 1943 Selective Service report 36 percent of the registrants examined at Induction Stations were found unsuitable for military service. However, this figure includes those who were turned down for mental disease, mental deficiency, educational deficiency, and for nonmedical reasons. Correcting for these factors leaves a residual of 28 percent rejected for purely medical conditions. Thus psychopaths compare favorably with registrants as far as their physical condition is concerned. The comparative results on physical defects as shown in table 5 likewise

TABLE 5.—*Principal medical diagnosis for physically defective psychopathic prisoners compared with principal physical cause for rejection of civilian registrants for military service*

Physical defect	Psychopaths	Registrants	Physical defect	Psychopaths	Registrants
	Percent	*Percent*		*Percent*	*Percent*
Dental, mouth, gums	4	3	Nose, sinus, throat	2	1
Eye	20	11	Lungs [1]	8	8
Skin	4	1	Hemorrhoids	5	1
Venereal	12	13	Neurological	8	8
Musculo-skeletal	16	12	Ear	3	7
Genitalia	3	1	Other	8	22
Cardiac	7	12			

[1] Includes tuberculosis.

reveal no significant differences except for the higher proportion of visual defects among psychopaths.

Work record.—Thirteen percent of the psychopathic subjects were unemployable for one reason or another, 12 percent were assigned as orderlies or common laborers, 54 percent were placed on maintenance work, 10 percent worked in the industries, 3 percent were employed as technical assistants, 7 percent as clerks, and 1 percent were given other assignments. Inmates working in the industries have the best assignment, inasmuch as they earn industrial good time as well as a small monetary wage. The industrial good time simply means that the individual is released from the institution at an earlier date as a reward for his work. The average number of work assignments per year per man was 1.4, or 2.2 assignments for the period of time spent at the Medical Center.

Although psychopaths are generally described as poor workers, 6 percent made an excellent work adjustment, 36 percent a good work adjustment, and 18 percent a satisfactory work adjustment. In other words, the work reports were satisfactory or better in 60 percent of the cases. Of the remaining 40 percent, 13 percent were unemployable, 12 percent were poor workers, and 15 percent were fair, that is, only did what they were told to do and did not take any initiative.

Institutional adjustment.—Forty-three percent of the subjects made a poor dormitory adjustment, 17 percent an average adjustment, and 40 percent an above-average adjustment. In other words, more than 50 percent were not any worse in their behavior than the average inmate of a penitentiary.

Analysis of adverse behavior reports also confirms this impression. Thirty-four percent were not reported for misbehavior during their stay in the institution, 32 percent were reported only for minor infractions, 15 percent were reported for insolence, 15 percent for fighting, 12 percent for agitating, 7 percent for destruction of property, 5 percent for paranoid attitude, 5 percent for "assaultiveness," 5 percent for engaging in homosexual practices, and 4 percent for conniving. It is understood that duplications occur, some individuals engaging in all types of misbehavior. The average number of disciplinary reports per year was 1.4, or 2.2 for the period of time spent at the Medical Center.

The disciplinary action taken on adverse behavior reports was distributed as follows: No action or no report of action, 35 percent; reprimand and warning, 13 percent; loss of privileges, 45 percent; segregation, 40 percent; loss of good time, 11 percent; new sentence, 2 percent; reprimand and loss of privileges, 7 percent; loss of privileges and segregation, 27 percent; and segregation and loss of good time, 9 percent.

Those who were placed in punitive segregation spent an average of 14.8 weeks per year in segregation. Those who were placed in isolation for administrative or therapeutic reasons, of which there were 7 percent, spent an average of 10 weeks per year in such segregation. If this is prorated among all the subjects, punitive segregation averages 6.1 weeks per year, and administrative or therapeutic segregation averages 0.7 week per year.

Treatment.—All the subjects received routine psychiatric care, and this care consisted principally of occasional interviews in regard to progress in the institution, assignment to work and quarters, and participation in various recreational and religious activities. Approximately one-third of the subjects took part in group therapy programs. In addition, upwards of 8 percent were given more intensive individual psychotherapeutic interviews. Two percent were given electric shock treatment. Fifty-two percent required medical attention, and 14 percent surgical treatment.

Sixty-four percent of the subjects did not participate in any sort of educational program either at the referring institution or at the Medical Center, 18 percent enrolled in school but showed little or no progress, 15 percent completed correspondence courses, 2 percent completed formal school work, and only 1 percent completed vocational training.

The treatment record for the psychopathic prisoners leaves much to be desired. However, treatment cannot be forced on prisoners. If they are unwilling to cooperate, nothing can be done about it. Cooperativeness is not one of the virtues of psychopaths, and they do not react very favorably to anything forced upon them. The best that one can do is to present the opportunity, and hope that the individual will take advantage of it.

Yet, whatever the treatment, it was not entirely ineffective. Thirteen percent of the subjects improved physically during their sojourn at the Medical Center, 85 percent showed no change in their physical condition, and 2 percent became worse from a physical standpoint. In regard to their behavior, 31 percent improved, 11 percent became worse, and 58 percent remained unchanged.

The prognosis given on discharge was as follows: Medical good, 76 percent; medical fair, 15 percent; and medical poor, 9 percent; delinquency good, 9 percent; delinquency fair, 23 percent; and delinquency poor, 68 percent.

Discharge data.—The subjects served an average of 33.9 months on their sentences, of which 18.5 months were spent at the Medical Center. Eight percent were discharged from the Medical Center by commutation of sentence, remission of sentence, or executive clemency; only 2 percent were released on parole; 64 percent were discharged

on conditional release; 14 percent were set free after completing their maximum sentences; 11 percent were transferred to other institutions; and 1 percent died. Comparable figures for all male Federal offenders show that 40 percent were discharged on conditional release, 32 percent on maximum expiration of sentence, 26 percent on parole, and 2 percent under other conditions exclusive of transfer. In other words, far fewer psychopathic prisoners than Federal prisoners are released on parole. On the other hand, a substantially larger number of Federal prisoners are required to serve their full sentences. This is probably due to the fact that a good many Federal offenders served sentences of less than 1 year and 1 day. The conditional release law does not apply to such cases.

FOLLOW-UP DATA

The only satisfactory follow-up is to have a social worker trace each case individually. Since that could not be done, the Federal Bureau of Investigation reports of subsequent arrests were used. Hence the only follow-up data available concerns antisocial activity resulting in arrest after the individual was discharged from the Medical Center.

Two of the subjects were picked up on detainers and given new sentences to serve, 5 were admitted to mental hospitals, and 4 died. These 11 cases are excluded from the ensuing follow-up statistics. There were 51 cases who were transferred to other Federal penal and correctional institutions. These cases were also excluded from the follow-up data since their sentences had not expired.

The follow-up results on the remaining 438 cases are shown in table 6. The subjects had been out in the civilian population an average of 19.2 months and a median of 16.8 months.

TABLE 6.—*Recidivism according to time elapsed since release from Medical Center based on follow-up reports for 438 male psychopathic prisoners*

	Time elapsed since release (years)			
	0.0–0.9	1.0–1.9	2.0–2.9	3.0–4.9
	Percent	*Percent*	*Percent*	*Percent*
Recidivist	21	31	37	37
Not a recidivist	79	69	63	63

These results are encouraging. Psychopaths may be bad prisoners, but the majority of them managed to stay out of trouble with the law even after they had been out 3 years or more. It appears that those who relapsed to antisocial behavior did so during the first 3 years of freedom. In fact, more than half of those who relapsed did so during the first year, and this indicates the need for some kind of assistance during this transition period. Of course, the subjects after

release were in the general civilian population during a time when it was easy to get a job, and this may account for the comparatively good showing.

Whether or not the individual had some supervision after release makes some difference Of those who had no supervision, 36 percent became recidivists. Of those who had supervision, 29 percent became recidivists. Since this supervision is rather nominal, the results might be further improved by a more effective type of supervision, that is, by decreasing the case load of probation officers so that they could devote more time to each individual. Of those subjects who ran afoul of the law after release from the Medical Center, 32 percent were returned to Federal institutions, 61 percent were returned to non-Federal institutions, and 7 percent served time in both Federal and non-Federal institutions.

DISCUSSION

One of the values of a statistical study such as this lies in finding leads for further research. One of these leads is the relationship of age to psychopathy. A suggested method of tackling this problem would be to review the records of prisoners admitted to Federal penal and correctional institutions some 25 years ago, and attempt to pick out a group of psychopaths on the basis of these records. The later careers of these individuals could then be followed to see what has happened to them.

Another promising lead is the relationship of marital status to psychopathy. By using the group mentioned above, one might determine how many psychopaths remain single, whether or not marital failures continue, and if psychopaths reproduced to the same extent as normal individuals.

Why psychopaths tend to come from urban areas is another question which should be investigated further. To investigate this problem, one would have to select a group of psychopaths and make a detailed study of their places of residence from birth on, what parts of cities they lived in, where their parents came from, the type of home, and other data having to do with the physical environment.

The relationship of car stealing to psychopathy is another factor which is worth investigating. Violators of the National Motor Vehicle Theft Act among the psychopaths should be studied with a view to finding out the reason for car thievery, whether or not the parents owned a car, whether use of the family car was denied, whether or not the best girl friend had to be impressed, and so on.

The large percentage of subjects who came from disrupted homes presents a problem which is also worth further attention. In order to investigate this question properly, it would be necessary to use a

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control group of normal individuals. We have only a vague idea concerning the number of disrupted homes among the general civilian population.

There are other factors which should be analyzed in greater detail, such as the influence of heredity, training in early childhood, interpersonal relationships between members of the family, etc. It might be possible to clarify some of these topics by using hypnoanalysis on a group of subjects. Other problems would require painstaking histories and search for verified information and records in the field, not in the institution.

SUMMARY

The present investigation consists of a general statistical analysis of the clinical records of 500 psychopathic prisoners admitted to and subsequently discharged from the Medical Center for Federal Prisoners at Springfield, Mo. The subjects were discharged from the institution during the period July 2, 1940, to December 31, 1944, inclusive.

The easiest way to summarize the findings is to describe a "statistical" criminal psychopath cómposed of medians and highest frequencies. Such a composite individual would be a white, male prisoner, 22 years of age at the time of his admission to one of the Federal penal and correctional institutions, to which he would be committed for violation of the National Motor Vehicle Theft Act for a term of 43 months. His family history would be negative for psychopathic determinants such as insanity, alcoholism, etc. The continuity of his parental home would be disrupted before he attained his eighteenth birthday by the death of one or both parents or by the separation or divorce of his parents. The chances are about equal that his parents would be in poor or comfortable economic circumstances. He would have a normal attachment to his parents and siblings. Among the latter he would occupy an intermediate position, that is, he would be neither the youngest nor the oldest child.

This hypothetical person would be brought up in the Protestant faith, but would discontinue church affiliations as an adult. He would be native born, of native parentage, and of Nordic descent. He would not quite finish the eighth grade, and his occupation would be that of a more or less unskilled laborer or operative. He would live in a city of 5,000 or more population. He would be single, in poor economic circumstances, and as a child would be described as headstrong, willful, and difficult to manage, or in frequent mischief. He

would make a normal heterosexual adjustment. He very probably would have a history of alcoholism, nomadism, or shiftlessness. In general he would not give a history of military service, but if he did, he would have been given a discharge other than honorable.

He would have a bad antisocial record, his first arrest occurring at the age of 16 for larceny or some other crime against property, for which he would be sent to a penal or correctional institution. He would have a total of 3 commitments under sentence of 1 year or less, and at least one prior commitment under sentence of more than 1 year. His principal antisocial activity would be committing crimes against property, ostensibly because he was inadequately trained or brought up in an undesirable home. He would serve most of his time in adult penal institutions and jails. He would be transferred from a Federal penitentiary to the Medical Center.

He would give a history of the usual diseases of childhood without sequelae, but would deny venereal disease and mental disease. He would have an I. Q. of 102, indicating normal intelligence. He would have no incapacitating physical defects, and would be capable of normal physical exertion. The most important medical diagnosis would be some kind of visual defect, in addition to the psychiatric diagnosis of psychopathic personality with asocial and amoral trends. He would serve 28 months on his current sentence, and 16 of these months would be spent at the Medical Center.

During his stay at the Medical Center he would be assigned to some type of maintenance work, and would have at least one change of work assignment. His work would be good or satisfactory. He would make an average or above-average dormitory adjustment. He would have one disciplinary report for some minor infraction of the rules, and as punishment would be deprived of certain privileges for a time. During his stay at the institution, he would receive routine psychiatric care, and would require attention for some medical condition. He would not take part in an educational program. He would pass through and out of the institution without any appreciable change, either from a physical or behavioral standpoint. He would be discharged on conditional release, with a poor prognosis regarding delinquency, and he would not be recommended for any further treatment. Despite the poor delinquency prognosis, 17 months after release he would still be on the good side of the law, indicating that a bad prisoner is not necessarily an unrehabilitated criminal.

ACKNOWLEDGMENT

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

February 24–March 23, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended March 23, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended March 23 there were 1,399 cases of diphtheria reported as compared with 1,062, 972, and 957 for the corresponding 4 weeks in 1945, 1944, and 1943, respectively. The preceding 5-year median was represented by the 1945 figure (1,062 cases). In the Middle Atlantic and Mountain sections the numbers of cases were about normal, but in all other sections the incidence was relatively high, the increases ranging from 1.2 times the preceding 5-year median in the West South Central section to 2.3 times the median in the East North Central section. For the country as a whole the current incidence was the highest reported for this period since 1939 when 1,724 cases were reported for the corresponding 4-week period.

Influenza.—The number of cases of influenza (18,400) reported for the current period was about 40 percent higher than the 1945 incidence, but it was only slightly above the preceding 5-year median (17,615 cases). The greatest excess over the normal seasonal expectancy was reported from the West South Central section, with minor increases in the New England, East North Central, and Pacific regions; in all other sections the incidence was relatively low.

Measles.—The number of cases of measles rose from 48,914 during the preceding 4 weeks to 117,342 during the 4 weeks ended March 23. The number of cases was 8 times the number reported for the corresponding period in 1945 and 1.4 times the 1941–45 median. Each section of the country reported an increase over the 1945 figures and each one except the New England, West North Central, and South Atlantic sections reported an increase over the normal (median) seasonal expectancy; in each of the 3 sections mentioned the incidence was considerably below the 1941–45 median. The highest incidence was reported from the Middle Atlantic, East North Central, and Pacific sections.

Smallpox.—The smallpox incidence during the current 4-week period was about the same as during the corresponding weeks in 1945, but the number of cases (41) was less than 50 percent of the 1941–45 median. Of the total cases 11 were reported from the West South Central and 12 occurred in the Pacific section, as compared with median expectancies of 13 and 2 cases, respectively. In other sections where cases occurred the numbers either closely approximated or fell below the median. Including the last week in March there were 34 cases in the 5-week period; 26 in Washington and 8 in California.

Typhoid and paratyphoid fever.—The incidence of these diseases during the current 4-week period stood at the 1945 level, but the number of cases (198) was only about 80 percent of the 1941–45 median. In the New England and Mountain sections the incidence was higher than the median expectancy, and in the West South Central region the incidence was about normal, but in all other sections the incidence was relatively low.

Whooping cough.—The number of reported cases of whooping cough (7,406) was 70 percent of the 1945 incidence during the corresponding 4 weeks and 50 percent of the 1941–45 median figure. For the country as a whole the current incidence is the lowest for this period in the 9 years for which these data are available. The greatest declines from the preceding 5-year medians occurred in the Middle Atlantic and East North Central regions, but in each section of the country the incidence was considerably below the seasonal expectancy.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Feb. 24–Mar. 23, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period, 1941–45.

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,399	1,062	1,062	18,400	13,358	17,615	117,342	14,337	87,789
New England	44	29	25	94	113	83	3,099	1,159	6,153
Middle Atlantic	148	107	140	71	48	108	35,849	1,239	21,783
East North Central	328	127	142	710	311	533	29,382	1,018	13,993
West North Central	111	117	80	134	103	231	7,371	490	7,699
South Atlantic	200	138	156	4,299	4,414	6,029	9,193	1,475	13,329
East South Central	128	108	88	1,391	888	1,609	4,305	525	3,863
West South Central	260	183	209	9,939	6,662	6,921	7,343	2,737	5,634
Mountain	50	51	52	1,144	656	1,257	4,969	640	4,004
Pacific	130	202	99	618	163	553	15,831	5,054	8,469
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	756	1,018	1,018	142	112	80	16,020	26,097	18,079
New England	37	45	50	9	5	4	1,364	2,361	2,361
Middle Atlantic	147	239	239	15	32	7	4,844	6,739	5,269
East North Central	148	188	188	13	9	9	4,413	6,713	5,420
West North Central	55	70	70	2	7	7	1,386	2,256	2,005
South Atlantic	121	158	158	34	17	10	1,522	2,869	1,184
East South Central	72	93	93	8	13	9	455	775	775
West South Central	86	101	101	19	16	12	465	791	429
Mountain	12	13	13	10	1	5	517	1,182	848
Pacific	78	111	111	32	12	13	1,054	2,411	897
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	41	39	90	198	196	241	7,406	10,667	15,039
New England	0	0	0	19	13	8	1,168	1,599	1,465
Middle Atlantic	0	0	0	25	43	44	1,778	2,137	3,230
East North Central	6	13	18	24	28	31	1,467	1,569	3,041
West North Central	5	10	12	7	8	10	252	377	632
South Atlantic	2	2	2	38	35	59	863	1,521	1,626
East South Central	5	6	6	16	17	18	220	435	566
West South Central	11	5	13	39	23	40	747	1,196	1,196
Mountain	0	3	3	12	23	9	853	399	501
Pacific	12	0	2	18	6	24	558	1,434	1,497

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

MORTALITY, ALL CAUSES

For the 4 weeks ended March 23 there were 39,097 deaths from all causes reported to the Bureau of the Census by 93 large cities. The preceding 3-year average was 39,079 deaths. During the first week of the 4-week period the number of deaths was 5.3 percent above the 3-year average and there was a minor increase in the second week; in the third and fourth weeks, however, the declines from the averages were 4.5 and 1.8 percent, respectively, making the increase during the current 4 weeks less than 0.05 percent over the 1943–45 average.

Poliomyelitis.—For the 4 weeks ended March 23 there were 142 cases of poliomyelitis reported, the number being 1.3 times the 1945 figure for the corresponding weeks and 1.8 times the 1941–45 median.

Compared with the 1945 figures the current incidence was higher in 6 of the geographic sections and lower in 3 sections, the Middle Atlantic, West North Central and East South Central. As compared with the preceding 5-year medians the current incidence was higher in 7 sections, being lower in the West North Central and about the same in the East South Central section. The greatest increases over the normal seasonal expectancy were reported from the Atlantic and Pacific coast sections.

DISEASES BELOW MEDIAN PREVALENCE

Meningococcus meningitis.—For the 4 weeks ended March 23 there were 756 cases of this disease reported, as compared with 733 during the preceding 4 weeks. The number of cases was 75 percent of the 1941–45 median, which is represented by the 1945 figure (1,018 cases). In the Mountain section the number of cases was about normal, but in all other sections the incidence was considerably below the preceding 5-year median figures.

Scarlet fever.—The number of reported cases of scarlet fever (16,020) was about 60 percent of the number reported for the corresponding period in 1945 and 90 percent of the 1941–45 median. The South Atlantic and West South Central sections reported a few more cases than might normally be expected, but in all other sections the incidence was considerably below the preceding 5-year median.

DEATHS DURING WEEK ENDED MARCH 23, 1946

[From the Weekly Mortality index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 23, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	9,569	9,640
Average for 3 prior years	9,747	
Total deaths, first 12 weeks of year	123,115	117,103
Deaths under 1 year of age	582	650
Average for 3 prior years	651	
Deaths under 1 year of age, first 12 weeks of year	7,253	7,672
Data from industrial insurance companies:		
Policies in force	67,174,982	67,158,424
Number of death claims	14,354	15,526
Death claims per 1,000 policies in force, annual rate	11.1	12.1
Death claims per 1,000 policies, first 12 weeks of year, annual rate	11.4	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 30, 1946

Summary

Of the total of 28 cases of smallpox, as compared with 14 last week and 31 for the 5-year median, 19 occurred in the State of Washington. Up to March 30, 26 cases with 5 deaths had been reported in the Seattle-King County area. To the same date, 7 cases, with no deaths, had been reported in San Francisco, Calif.[1]

Following increases during the past 2 weeks, the incidence of diphtheria declined. A total of 327 cases of diphtheria was reported for the current week, as compared with 368 last week and a 5-year median of 242. States reporting more than 10 cases each are New York (27), Pennsylvania (24), Ohio (21), Illinois (25), Maryland (18), Texas (19), and California (29). The cumulative total, 4,938, is more than reported for a corresponding period since 1940.

Of 35,676 cases of measles, as compared with 34,300 last week and 26,183 for the 5-year median, 20,030 cases, or 56 percent, occurred in the Middle Atlantic and East North Central areas. In the 4 other widely separated States reporting more than 660 cases each, Massachusetts (1,149), Kansas (1,077), Texas (1,923) and California (3,047), an aggregate of 7,196 cases occurred. The total to date is 222,217, as compared with 306,417 for the corresponding period in 1944, and a 5-year median of 210,408.

A total of 149 cases of meningococcus meningitis was reported (as compared with 166 last week and a 5-year median of 216), of which New York reported 24, Ohio 12, Illinois 17, and California 9. The cumulative total, 2,548 cases, is a smaller number than reported for the corresponding period of any of the past 3 years.

Of the total of 25 cases of poliomyelitis, New Mexico and California reported 4 each and New York and Florida 3 each. Although the current incidence is only slightly above the median, the total to date, 518 cases, due to slow decline in some localities early in the year, is more than for the corresponding period of any year since 1928. In that year, while the figure for the period was 586, the incidence throughout the remainder of the year was not excessively high.

Deaths recorded for the week in 92 large cities of the United States aggregated 9,426, as compared with 9,533 last week, 9,112 and 9,442 for the corresponding weeks of 1945 and 1944, and a 3-year average of 9,507. The cumulative total is 132,127, as compared with 125,811 for the corresponding period last year.

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[1] See p. 585.

Telegraphic morbidity reports from State health officers for the week ended Mar. 30, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945	
NEW ENGLAND												
Maine	2	0	0	------	------	------	27	3	41	0	3	3
New Hampshire	0	0	0	3	------	------	13	------	8	0	0	0
Vermont	1	0	0	------	------	------	5	6	70	0	0	0
Massachusetts	4	6	3	------	------	------	1,149	198	1,085	1	9	9
Rhode Island	1	0	0	1	49	1	5	7	11	3	1	1
Connecticut	2	0	1	5	3	3	163	97	365	2	5	5
MIDDLE ATLANTIC												
New York	27	16	17	[1] 2	[1] 3	[1] 15	5,011	88	2,799	24	18	30
New Jersey	4	3	3	4	7	9	2,971	63	1,653	5	5	5
Pennsylvania	24	12	11	2	------	------	3,790	172	1,424	7	11	11
EAST NORTH CENTRAL												
Ohio	21	10	9	4	10	10	635	58	1,227	12	15	7
Indiana	6	7	6	8	5	23	1,045	39	294	1	2	2
Illinois	25	6	15	8	33	23	1,620	102	1,271	17	17	17
Michigan [2]	7	55	8	2	------	4	2,410	104	1,295	2	7	7
Wisconsin	0	0	1	22	46	55	2,548	42	1,447	2	1	1
WEST NORTH CENTRAL												
Minnesota	5	1	1	------	------	------	32	11	126	5	3	3
Iowa	4	0	2	------	------	5	118	89	267	0	2	2
Missouri	5	10	4	1	2	3	434	18	157	5	6	6
North Dakota	1	1	0	10	------	------	16	8	56	1	1	0
South Dakota	5	2	2	------	------	------	19	19	19	0	5	0
Nebraska	3	4	4	------	2	9	194	25	125	1	0	0
Kansas	2	2	3	1	------	3	1,077	23	646	1	0	2
SOUTH ATLANTIC												
Delaware	1	0	0	------	------	------	26	5	22	0	1	1
Maryland [2]	18	11	4	7	2	8	582	53	393	2	6	5
District of Columbia	0	1	1	------	------	1	350	6	91	1	0	2
Virginia	4	4	4	180	215	311	628	108	621	4	6	5
West Virginia	1	2	5	3	7	22	130	52	209	3	7	4
North Carolina	9	5	8	------	------	26	470	58	1,090	3	5	3
South Carolina	5	6	5	482	389	473	584	69	347	1	2	2
Georgia	4	4	4	7	13	45	267	52	264	2	2	4
Florida	4	1	3	3	2	5	231	18	260	3	2	2
EAST SOUTH CENTRAL												
Kentucky	7	5	5	69	------	9	342	12	111	2	5	5
Tennessee	7	8	4	22	27	57	297	81	378	3	7	7
Alabama	8	7	7	93	66	324	164	13	320	6	8	5
Mississippi [2]	5	6	3	------	------	------	------	------	------	3	3	3
WEST SOUTH CENTRAL												
Arkansas	10	4	4	98	33	87	222	54	264	3	2	1
Louisiana	5	9	3	109	55	8	310	24	121	5	2	2
Oklahoma	5	5	2	73	131	141	213	26	95	0	3	1
Texas	19	33	34	1,105	1,153	1,143	1,923	718	1,825	4	16	16
MOUNTAIN												
Montana	3	0	0	2	21	13	45	10	150	1	1	0
Idaho	2	4	0	25	1	------	103	14	27	0	0	0
Wyoming	3	0	1	------	------	12	27	11	104	0	0	0
Colorado	9	7	7	35	23	40	639	11	354	0	2	2
New Mexico	0	2	0	4	1	1	21	10	133	1	1	0
Arizona	5	2	2	111	92	96	136	11	109	0	0	0
Utah [2]	0	0	0	13	15	15	658	156	156	0	0	0
Nevada	0	0	0	------	------	------	2	------	9	0	0	0
PACIFIC												
Washington	7	10	6	------	------	2	625	234	261	2	1	3
Oregon	8	15	3	2	12	22	352	86	135	2	0	1
California	29	21	19	55	13	109	3,047	1,142	1,142	9	23	23
Total	327	307	242	2,571	2,431	3,465	35,676	4,206	26,183	149	216	216
13 weeks	4,938	4,020	3,820	175,984	51,155	61,452	222,217	32,221	210,408	2,548	3,232	3,232

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Mar. 30, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945		Mar. 30, 1946	Mar. 31, 1945	
NEW ENGLAND												
Maine	0	0	0	32	42	13	0	0	0	0	0	0
New Hampshire	0	0	0	6	18	14	0	0	0	0	0	0
Vermont	0	0	0	11	6	11	0	0	0	1	0	0
Massachusetts	0	1	0	222	434	431	0	0	0	0	0	0
Rhode Island	0	0	0	7	33	17	0	0	0	0	0	0
Connecticut	1	0	0	70	70	71	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	3	4	1	895	825	640	0	0	0	2	3	4
New Jersey	0	0	0	167	161	204	0	0	0	0	2	1
Pennsylvania	0	0	0	472	604	494	0	0	0	1	9	2
EAST NORTH CENTRAL												
Ohio	1	1	0	409	468	414	8	0	0	3	1	1
Indiana	0	2	0	97	122	154	0	3	1	1	0	0
Illinois	0	0	0	246	341	341	0	1	1	4	3	3
Michigan [2]	0	0	0	111	328	328	0	4	0	3	0	2
Wisconsin	0	0	0	152	317	317	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	49	116	89	0	0	0	0	0	0
Iowa	0	0	0	60	82	64	1	0	1	0	0	0
Missouri	0	1	0	55	98	80	0	0	0	1	2	1
North Dakota	0	0	0	16	25	21	0	0	0	3	0	0
South Dakota	0	0	0	8	11	11	0	0	0	0	0	0
Nebraska	0	1	0	41	82	55	0	1	0	0	0	0
Kansas	0	1	0	71	81	81	0	1	1	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	9	11	11	0	0	0	0	0	0
Maryland [2]	0	0	0	85	173	146	0	0	0	0	0	1
District of Columbia	0	0	0	25	50	20	0	0	0	0	0	0
Virginia	1	0	0	104	114	76	0	0	0	1	0	2
West Virginia	0	0	0	50	38	39	0	0	0	0	1	1
North Carolina	2	3	0	39	69	32	0	0	0	1	0	0
South Carolina	0	1	0	18	10	5	0	0	0	0	1	1
Georgia	0	1	0	12	27	15	0	1	0	2	3	3
Florida	3	0	0	9	7	7	0	0	0	0	1	2
EAST SOUTH CENTRAL												
Kentucky	0	3	1	31	68	71	0	0	0	1	0	1
Tennessee	0	0	0	35	38	48	0	0	0	2	1	2
Alabama	1	1	0	44	16	16	1	0	0	5	3	2
Mississippi [2]	0	0	1	6	38	9	0	2	1	0	0	1
WEST SOUTH CENTRAL												
Arkansas	2	1	0	11	10	7	0	1	1	2	2	1
Louisiana	0	0	0	13	15	7	1	0	0	2	2	2
Oklahoma	0	1	0	8	24	17	0	1	1	0	2	1
Texas	2	5	0	53	118	118	0	0	3	13	4	5
MOUNTAIN												
Montana	0	0	0	6	14	32	0	0	0	0	0	0
Idaho	0	0	0	8	51	7	0	0	0	0	1	0
Wyoming	0	0	0	5	12	19	0	0	0	0	0	0
Colorado	1	0	0	27	72	39	0	2	0	0	0	0
New Mexico	4	0	0	7	18	4	0	0	0	2	1	1
Arizona	0	0	0	13	49	19	1	0	0	1	0	0
Utah [2]	0	0	0	25	69	49	0	0	0	0	0	0
Nevada	0	0	0	0	1	1	0	0	0	0	0	0
PACIFIC												
Washington	0	0	0	41	160	40	19	1	1	0	0	0
Oregon	0	0	0	29	43	12	0	0	0	0	0	0
California	4	1	1	229	318	136	0	0	0	2	3	3
Total	25	28	19	4,139	5,897	4,465	26	18	31	55	45	59
13 weeks	518	453	330	44,541	73,991	52,173	125	186	302	573	719	953

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Vermont 1; Connecticut 1; Indiana 1; Georgia 1; Texas 1.

Telegraphic morbidity reports from State health officers for the week ended Mar. 30, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Mar. 30, 1946	Whooping cough: Week ended— Mar. 31, 1945	Whooping cough: Median 1941-45	Week ended Mar. 30, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	12	33	33								
New Hampshire	2	11	11								
Vermont	50	45	35								2
Massachusetts	150	202	196		1						
Rhode Island	21	15	19								
Connecticut	60	35	51	1							2
MIDDLE ATLANTIC											
New York	200	231	334		1						5
New Jersey	141	84	98			1					
Pennsylvania	117	122	180								5
EAST NORTH CENTRAL											
Ohio	70	175	175								3
Indiana	26	13	25								5
Illinois	78	57	95	1			2		3		6
Michigan [2]	101	121	131				1				3
Wisconsin	81	53	101						1		15
WEST NORTH CENTRAL											
Minnesota	7	16	29	3							4
Iowa	8	3	18								[4] 54
Missouri	4	8	8								1
North Dakota			2								
South Dakota		3	3								2
Nebraska		11	8								
Kansas	25	47	49								4
SOUTH ATLANTIC											
Delaware	1	10	7								
Maryland [2]	20	51	51			1					1
District of Columbia	5	4	6								
Virginia	14	48	54			37					1
West Virginia	15	14	53								
North Carolina	98	94	156								
South Carolina	67	88	88	6	3						
Georgia	22	28	28		2				1	4	4
Florida	22	7	18	1			2			8	
EAST SOUTH CENTRAL											
Kentucky	24	28	49								
Tennessee	18	14	23			7			2	2	1
Alabama	18	21	51				3		4	4	5
Mississippi [2]									1		
WEST SOUTH CENTRAL											
Arkansas	4	17	17	1							1
Louisiana	2	5	5							2	1
Oklahoma	4	13	13	1							1
Texas	132	302	302	4	198	12		1	2	12	14
MOUNTAIN											
Montana	1	9	10						1		
Idaho	7	3	5								
Wyoming	1	3	3								2
Colorado	22	30	30								
New Mexico	7	7	13								
Arizona	15	19	40			16					
Utah [2]	24	57	51						1		1
Nevada											
PACIFIC											
Washington	31	22	34								2
Oregon	7	28	28								
California	83	344	344	6	3		1			1	4
Total	1,817	2,551	3,414	24	208	74	9	1	16	33	95
Same week, 1945	2,551			38	291	71	5	0	20	43	85
Average, 1945	2,905			46	223	70	9	[5] 2	18	[5] 29	
13 weeks: 1946	23,619			483	3,667	1,386	106	6	267	609	972
1945	31,641			370	6,203	1,619	93	4	246	656	1,099
Average, 1943-45	35,646		[5] 50,708	370	3,798	1,007	122	[5] 4	204	[5] 536	

[2] Period ended earlier than Saturday.
[4] Delayed reports, included in cumulative total only.
[5] 5-year median, 1941-45.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 23, 1946

This table lists the reports from 88 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	2	0	1	0	0	0	3	0	0	18
New Hampshire:												
Concord	0	0		0		0	2	0	1	0	0	
Vermont:												
Barre	0	0		0		0	0	0	0	0	0	
Massachusetts:												
Boston	1	0		0	231	1	17	0	38	0	0	11
Fall River	0	0		0	12	1	0	0	3	0	1	6
Springfield	0	0		0	6	0	1	0	14	0	0	1
Worcester	0	0		0	41	0	5	0	8	0	0	17
Rhode Island:												
Providence	2	0	1	0	4	0	3	0	0	0	0	36
Connecticut:												
Bridgeport	0	0		0	3	0	1	0	3	0	0	1
New Haven	0	0		0	44	0	3	0	4	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0		0	252	0	4	1	10	0	0	14
New York	13	0	3	0	1,335	14	65	0	402	0	1	25
Rochester	0	0		0	582	0	3	0	18	0	0	2
Syracuse	0	0		0	187	0	1	0	25	0	0	3
New Jersey:												
Camden	0	0		0	71	0	1	0	4	0	0	8
Newark	0	0	1	0	919	2	6	0	18	0	0	31
Trenton	0	0		0	5	0	6	0	2	0	0	1
Pennsylvania:												
Philadelphia	2	0	3	1	1,052	0	29	0	71	0	0	25
Pittsburgh	0	0	1	1	7	5	15	0	31	0	0	5
Reading	0	0		0	517	1	3	0	5	0	0	9
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	4	0		2	137	3	8	0	7	0	0	2
Cleveland	0	0	1	0	22	1	3	0	41	0	0	17
Columbus	1	0		0	5	0	4	0	13	0	2	3
Indiana:												
Fort Wayne	0	0		0	5	0	1	0	4	0	0	1
Indianapolis	2	0		1	628	1	5	0	19	0	0	4
South Bend	0	0		0	3	0	0	0	4	0	0	
Terre Haute	0	0		0		0	0	0	1	0	0	
Illinois:												
Chicago	2	0		1	815	4	37	0	99	0	0	36
Springfield	0	0		0	2	0	3	0	0	0	0	
Michigan:												
Detroit	2	0		1	1,783	0	12	0	54	0	0	30
Flint	0	0		0	1	0	2	0	2	0	0	
Grand Rapids	0	0		0	110	0	2	0	1	0	0	11
Wisconsin:												
Kenosha	0	0		0	3	0	0	0	1	0	0	
Milwaukee	0	0		0	873	0	8	0	31	0	0	42
Racine	0	0		0	2	0	0	0	1	0	0	1
Superior	0	0		0		0	0	0	0	0	0	
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0		0	4	0	2	0	4	0	0	
Minneapolis	4	0		0	21	0	5	0	5	0	0	1
St. Paul	1	0		0	1	2	6	0	15	0	0	3
Missouri:												
Kansas City	0	0	1	1	151	1	6	0	5	0	0	5
St. Joseph	0	0		0	14	0	0	0	1	0	0	
St. Louis	1	0	1	0	1	3	8	0	18	0	3	2

City reports for week ended Mar. 23, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	------	0	2	0	0	0	3	0	0	------
Nebraska:												
Omaha	1	0	------	0	35	0	3	0	8	0	0	------
Kansas:												
Topeka	0	0	------	0	86	0	0	0	10	0	0	7
Wichita	0	0	------	0	77	1	1	0	3	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	23	0	3	0	5	0	0	------
Maryland:												
Baltimore	12	0	------	1	333	3	5	0	39	0	0	8
Cumberland	0	0	------	0	------	0	1	0	4	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	0	214	5	9	0	25	0	1	7
Virginia:												
Lynchburg	0	0	------	0	17	0	0	0	2	0	0	1
Richmond	1	0	------	0	15	0	2	0	14	0	0	2
Roanoke	2	0	------	0	19	0	0	0	4	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	3	0	0	------
Wheeling	0	0	------	0	1	0	1	0	0	0	0	10
North Carolina:												
Raleigh	0	0	------	0	52	0	1	0	2	0	0	2
Wilmington	0	0	------	0	36	0	0	0	0	0	0	2
South Carolina:												
Charleston	1	0	11	0	17	0	0	0	0	0	0	3
Georgia:												
Atlanta	0	0	1	0	6	0	1	0	2	0	0	2
Brunswick	0	0	------	0	2	0	0	0	0	0	0	------
Savannah	0	0	1	0	5	0	1	0	1	0	0	------
Florida:												
Tampa	1	0	------	0	29	0	1	0	0	0	0	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	1	1	41	0	7	0	7	0	0	6
Nashville	0	0	------	1	23	0	4	0	2	0	0	1
Alabama:												
Birmingham	0	0	1	2	9	0	0	0	1	0	0	------
Mobile	0	0	1	2	2	0	2	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	6	1	0	0	6	0	0	------
Louisiana:												
New Orleans	0	0	------	0	7	2	5	2	5	0	2	------
Shreveport	0	0	------	0	------	0	2	0	3	0	0	------
Texas:												
Dallas	1	0	------	0	13	0	3	0	5	0	0	------
Galveston	0	0	------	0	8	0	1	0	0	0	0	------
Houston	2	0	------	0	6	0	9	0	2	0	1	------
San Antonio	1	0	2	2	42	1	5	0	0	1	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	1	0	0	0	------
Great Falls	0	0	------	0	5	0	0	0	1	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	34	0	1	0	1	0	0	------
Idaho:												
Boise	0	0	------	0	21	0	1	0	0	0	0	------
Colorado:												
Denver	1	0	4	0	355	0	5	0	10	0	0	16
Pueblo	0	0	------	0	12	0	0	0	0	0	0	4
Utah:												
Salt Lake City	0	0	------	2	112	0	1	0	6	0	0	10

City reports for week ended Mar. 23, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	2	0	------	0	199	0	3	0	6	1	2	4
Spokane	0	0	------	0	149	0	3	0	2	0	0	5
Tacoma	3	0	------	0	23	0	0	0	4	0	0	5
California:												
Los Angeles	2	0	8	2	333	3	9	0	38	0	0	10
Sacramento	0	0	1	0	206	0	0	0	1	0	0	1
San Francisco	0	0	4	1	324	2	7	0	16	1	0	2
Total	66	0	49	22	12,749	57	374	4	1,227	3	13	482
Corresponding week, 1945	46	------	54	29	931	------	436	------	1,851	1	8	692
Average, 1941–45	63	------	188	[1] 39	[2] 6,668	------	[1] 474	------	1,785	1	13	812

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Dysentery, amebic.—Cases: New York, 6; Chicago, 1; Detroit, 3.
Dysentery, bacillary.—Cases: Providence, 1; New York, 1; Chicago, 1; Detroit, 2; St. Louis, 1; Los Angeles, 3.
Dysentery, unspecified.—Cases: San Antonio, 6.
Tularemia.—Cases: Chicago, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: Savannah, 1; Mobile, 1; New Orleans, 1; Houston, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 88 cities in the preceding table (estimated population, 1943, 34,151,900)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	9.0	0.0	9.0	0.0	979	5.7	91.6	0.0	212	0.0	2.9	266
Middle Atlantic	6.9	0.0	3.7	0.9	2,280	10.2	61.6	0.5	271	0.0	0.5	57
East North Central	6.7	0.0	0.6	3.0	2,669	5.5	51.7	0.0	169	0.0	1.2	89
West North Central	13.9	0.0	4.0	2.0	780	13.9	61.7	0.0	143	0.0	6.0	36
South Atlantic	28.4	0.0	21.7	1.7	1,284	13.4	41.8	0.0	169	0.0	1.7	62
East South Central	5.9	0.0	17.7	35.4	443	0.0	76.7	0.0	59	0.0	0.0	41
West South Central	11.5	0.0	5.7	5.7	235	11.5	71.7	5.7	60	2.9	8.6	0
Mountain	7.9	0.0	31.8	15.9	4,281	0.0	63.5	7.9	143	0.0	0.0	238
Pacific	11.1	0.0	20.6	4.7	1,952	7.9	34.8	0.0	106	3.2	3.2	43
Total	10.1	0.0	7.5	3.4	1,952	8.7	57.3	0.6	188	0.5	2.0	74

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

No new cases of smallpox were reported in San Francisco during the week ended March 30. To that date seven cases had been reported in San Francisco and one case in San Diego, with no fatalities. Doctor Geiger, the city health officer, reports the application of mass immunization.

Dr. Arthur L. Ringle, director of health of Washington State, reports a total of 31 cases, 2 suspect cases, and 5 deaths in the Seattle-King County area up to April 1. Of these cases, 12 were varioloid. All deaths were in cases of the hemorrhagic type of the disease. Doctor Ringle estimated that 200,000 vaccinations had been done during the week ended March 30, and advocated State-wide immunization.

The latest previously reported smallpox in these cities was 1 case in San Francisco in 1939, 5 cases in Seattle in the same year, and 1 case in San Diego in 1942. No case has been reported in Los Angeles since 1939, in which year 18 cases occurred.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 2, 1946.—During the week ended March 2, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		8		69	280	19	57	30	106	569
Diphtheria		1	3	22	7	7	2	1	2	45
German measles		9		56	9	1	3	7	7	92
Influenza		31			55	2			45	133
Measles		136	23	592	1, 521	2	5	14	41	2, 334
Meningitis, meningococcus			2	6	4	1	1		1	15
Mumps			1	84	211	43	14	51	127	531
Poliomyelitis				1						1
Scarlet fever		6	10	85	69	10	2	12	13	207
Tuberculosis (all forms)		15	3	153	81	9	7	27	33	328
Typhoid and paratyphoid fever				4	7		1		6	18
Undulant fever				1				1		2
Venereal diseases:										
Gonorrhea		27	4	109	182	49	19	51	124	565
Syphilis		15	4	120	109	16	5	13	52	334
Other forms				1						1
Whooping cough				56	39	3		2	1	101

JAMAICA

Notifiable diseases—4 weeks ended March 9, 1946.—During the 4 weeks ended March 9, 1946, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	3	3	Puerperal fever		2
Chickenpox	3	8	Scarlet fever	2	
Diphtheria	2	6	Tuberculosis (pulmonary)	14	40
Dysentery, unspecified	1	3	Typhoid fever	8	103
Erysipelas		2	Typhus fever (murine)	3	
Lethargic encephalitis		1			

NEW ZEALAND

Notifiable diseases—4 weeks ended December 29, 1945.[1]—During the 4 weeks ended December 29, 1945, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	6	1	Ophthalmia neonatorum	2	
Diphtheria	60	1	Poliomyelitis	3	
Dysentery:			Puerperal fever	3	
Amebic	5		Scarlet fever	85	
Bacillary	5		Tetanus	2	
Erysipelas	8		Trachoma	3	
Food poisoning	2		Tuberculosis (all forms)	123	43
Influenza	1		Typhoid fever	8	1
Malaria	12		Undulant fever	4	

[1] No report was received for the week ended Dec. 15, 1945.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China—Canton.—For the period March 1–26, 1946, 11 cases of cholera were reported in Canton, China. All precautionary measures have been taken.

India—Calcutta.—Cholera has been reported in Calcutta, India, as follows: Weeks ended—March 2, 1946, 57 cases, 31 deaths; March 9, 1946, 60 cases, 30 deaths.

Philippine Islands—Negros Province.—For the period November 25 to December 15, 1945, 1 case of cholera with 1 death was reported in Negros Province, Philippine Islands.

Plague

China—Fukien Province.—During the period March 1–26, 1946, 4 cases of plague (1 case each in Changpu, Haiteng, Pinghwo, and Yingting) were reported in Fukien Province, China.

Manchuria—Liaopeh Province—Szepingkai.—For the 2 days March 7 and 8, 1946, a total of 5 deaths from pneumonic plague was reported in Szepingkai, Liaopeh Province, Manchuria.

Smallpox

Brazil—Maranhao State—San Luiz.—Information dated March 19, 1946, states that a mild outbreak of smallpox had occurred in San Luiz, Maranhao State, Brazil. No reliable figures as to the number of cases are available but it is said that not more than 30 cases occurred on any one day. Vaccination is being carried on.

British East Africa—Tanganyika.—For the week ended February 23, 1946, 700 cases of smallpox with 98 deaths were reported in Tanganyika, British East Africa. These figures presumably include delayed reports.

Japan.—For the week ended January 19, 1946, 334 cases of smallpox were reported in Japan, including 171 cases reported in Hyogo, Japan.

Typhus Fever

Ecuador.—For the month of February 1946, 63 cases of typhus fever with 2 deaths were reported in Ecuador. Provinces reporting the highest incidence are: Chimborazo, 18 cases; Tungurahua, 11 cases; Azuay, 7 cases, 1 death; Cotopaxi, 7 cases, 1 death.

Egypt.—For the week ended February 23, 1946, 117 cases of typhus fever with 7 deaths were reported in all of Egypt.

Japan.—For the week ended January 19, 1946, 86 cases of typhus fever were reported in Japan. For the week ended January 5, 1946, 1 case each was reported in Tokyo and Niigata and 3 cases were reported in Fukuoka, Japan.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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A PUBLIC HEALTH PROGRAM FOR RURAL AREAS[1]

By FREDERICK D. MOTT, *Senior Surgeon (R), United States Public Health Service*[2]

Just as we are all against sin, so are we just as unanimously in favor of public health. There is no more popular subject for resolutions at conferences or for major emphasis in reports, articles, and addresses. There is widespread agreement, for example, that every section of the Nation should have access to complete public health services, that every rural area should have the unquestioned advantage of a health department under the direction of a full-time health officer. There is even close agreement as to details—desirable geographic and population coverage, program, staffing, and budgeting.

Then what is holding us up? The war is over, personnel is available to be trained, materials and labor will soon be at hand for health centers, State and local coffers are fuller than usual, the Federal Government can afford the equivalent of a couple of battleships each year, and we have the professional know-how. Is the trouble that we want hard-surfaced roads more than we want health? That people simply don't know what a first-rate public health program has to offer? Is the difficulty that county rights and county jobs and stifling tax limit legislation seem obstacles just too bothersome to overcome? Is the trouble perhaps largely with us, the leaders? Has lip service had an insidious tendency to be substituted for the kind of action which can achieve results?

Let's see how important organized preventive services are to the rural population, and then let's look at the record. Despite remarkable progress since the turn of the century, rural America has largely lost its advantageous position relative to urban health. Its disadvantage today is chiefly with respect to those conditions which can be influenced directly by modern health educational and preventive services. Thus the death rates of rural infants, preschool children,

[1] Presented at National Conference on Rural Health, sponsored by the American Medical Association, Chicago, Mar. 30, 1946.

[2] Chief Medical Officer, Farm Security Administration.

and youths 15 years of age and over where higher in 1940 than those of residents of large cities. While cities of 100,000 or more had an infant mortality rate of 34.3 in 1942, the rate was 43.3 in rural places and 44.6 in semirural towns. The rural maternity mortality rate in 1941 was almost one-third higher than the big-city rate.

The significance of a decent chance for life and good health for rural babies and mothers is far reaching. The rural birth rate exceeds the urban by a wide margin. In urban places of over 10,000 population 10 adults are raising 7 children; on farms 10 adults are raising 14 children. Over half of all the children in the Nation are found in rural communities. One result of this high birth rate and of economic and social pulls and pushes, is seen in the farm-to-city migration with which we are all familiar. If it were not for the constant flow to the cities, the urban population would decline about 24 percent in a generation. It is clear that if tomorrow's urban citizens are to have the opportunity to build sound bodies and alert minds in infancy and childhood, the benefits of scientific health care must be extended to the country as well as the city.

When we examine the causes of death as of 1940, we find that in general the infectious and more or less preventable diseases take larger rural tolls. This is true, for example, of pneumonia and influenza, diarrhea and enteritis, typhoid and paratyphoid fever, accidents, malaria, pellagra, diphtheria, measles, scarlet fever, and whooping cough. It may come as a surprise that the notifiable diseases, that is, the diseases that must be reported to health authorities, have higher case rates in the more rural States. If we take the most rural State and the most urban State in each of the nine census regions, we find that, as a group, the most rural States had higher case rates in 1942 for chickenpox, whooping cough, mumps, scarlet fever, diphtheria, septic sore throat, malaria, bacillary dysentery, typhoid and paratyphoid fever, tularemia, and smallpox.

It may be surprising, too, that trends show that tuberculosis and syphilis may soon become primarily rural. The total rural incidence of syphilis among men of draft age already has been estimated as higher than the urban rate. These trends have been accelerated by newer case-finding, treatment, and control measures which are being applied more rapidly among industrial workers and urban residents.

The whole pattern of rural deaths and rural disease is more like that found in the Nation as a whole in 1900 than is the corresponding urban pattern. In short, the picture still has some resemblance to the situation when infectious diseases and the results of grossly inadequate sanitation were prevalent everywhere. The implications are clear; organized preventive services in rural communities must be strengthened and must be broadened.

The record shows that to date far too little has been done to meet even the most obvious needs. Despite gratifying progress since passage of the Social Security Act in 1935, there were still 1,242 counties in 1942—40 percent of all the counties in the Nation—without full-time county or district health departments. Excluding the people covered by municipal health agencies in these counties, there still remained 33 million people, one-fourth of our national population, lacking the protection of a full-time health department.

Moreover, this consideration of the counties lacking any official health coverage gives only part of the picture. Few of the rural health departments we do have are housed, staffed, or financed in a manner adequate to their jobs. We find the typical health department housed in a setting hardly fitting to an agency which should symbolize sanitary maintenance and modern medical science. The personnel of the rural health department is nearly always inadequate in numbers and in type of training. The rural health officer is all too often untrained in the techniques of modern health administration. We have far too few well-trained public health nurses. We think of the South as relatively well covered by local health departments, but in 1940 the urban Northeast had more than double the supply of public health nurses found in the South.

The most decisive reflection of public health resources is the ratio of the health department's budget to the population it must serve. Competent authorities agree that $2 per capita is required to provide satisfactory public health services. Yet in rural counties the per capita expenditure for public health work is hardly 50 cents annually Total expenditures by local health agencies in our most rural States in 1942 were at only about half the rate of those in the most urban States.

With inadequate physical facilities, personnel, and financial resources, it is small wonder that the volume of public health services rendered by rural health departments falls far short of meeting the needs. A study of Farm Security borrower families in 1940 showed that only 37 percent of children up to 8 years of age had been vaccinated against smallpox either at public health clinics or by private practitioners. In contrast, 89 percent of children in this age group had been vaccinated in 28 large cities studied in the National Health Survey. Two out of every three rural counties in 1945 provided no regular "well baby" or "child health" conferences or clinics. And 3 out of 4 rural counties provided no regular monthly prenatal clinics. There is little doubt that high rural infant and maternal mortality rates are related to these deficiencies in public health services. Other categories of service show similar lacks. School health services, for example, are especially deficient in rural sections. The same story

holds true for tuberculosis control, venereal disease control, health education, or almost any other accepted function of a local health department.

These deficiencies point up the steps we must take to make organized preventive services available to the whole rural population. We would all agree that one of the best ways to prevent disease is to be sure that everyone has a good education and an adequate income so that he can have decent housing, a well-balanced diet, and enough rest and recreation. We know, too, that early diagnosis and prompt treatment of disease are the most potent weapons of preventive medicine. Beyond this, however, there are many specific preventive activities which should be carried out by a good public health department. It can help to provide for better environmental sanitation and prevent the occurrence of filth-borne diseases. It can teach the essentials of good nutrition and of sound hygienic practices. It can provide special care for expectant mothers and newborn infants. It can prevent the spread of devastation of venereal diseases and of tuberculosis, and can do much to control other communicable diseases. There is a tremendous field for health departments in the prevention of serious mental disorders through mental hygiene services.

Before a broad preventive program can be undertaken, an area must be served by a well-trained and adequately paid public health staff, headed by a competent medical officer. The staff should not only have a sufficient number of public health nurses (preferably one for every 2,000 people), and sanitarians (one for every 10,000 or 15,000 people), but, ideally, there also should be experts in health education, nutrition, sanitary engineering, laboratory work, and vital statistics. Attached to the staff, too, there should be public health dentists and special clinic physicians.

If a competent local staff is to be supported, greater financial resources are required than are available in most rural counties. The American Public Health Association has proposed a sound plan that would group counties with small populations into districts of at least 50,000 people. On this basis, the 3,070 counties in the Nation could be grouped into fewer than 1,200 districts, a far more sensible organization of public health than today's 18,000 independent, uncoordinated health jurisdictions.

Effective public health organization is possible only if adequate financial support is forthcoming. Federal grants-in-aid to the States for public health and maternal and child health services, and State financial aid to local health jurisdictions, have an important part to play in the attainment of these services. Nevertheless, the support which local communities give to public health must continue to play a fundamental rôle. If rural communities would put up about

$1 per person per year themselves, to match about another dollar coming from outside sources, far more could be done to improve rural health than anything we have accomplished up to this time.

There is another point concerning rural public health organization which deserves the thorough study of farm groups and of the medical profession. Most States now have permissive legislation regarding the establishment of local health departments. Under these laws a county or a community may appropriate funds for public health. Surely we have reached the stage where we should insist upon mandatory State legislation under which appropriate public health units would be established throughout the State and their financial support would be required. We already have laws of this kind governing the establishment of public schools. Similar legislation would be the surest way, and an entirely practical and intelligent way, to make public health services available to every rural citizen within a reasonable period of time.

While public health of the more or less traditional sort demands our attention as a fundamental need in every rural community today, it would be unrealistic not to look ahead to the new horizons of public health opening before us. The major public health problems today are the diseases which are not amenable to usual public health methods. These already cause about 21 out of every 22 deaths. They are largely the degenerative diseases of advancing years—the various diseases of the heart, the blood vessels and the kidneys, diabetes, cancer, and arthritis. This whole group of diseases is one which represents not only the major killers of our day but also the major causes of both acute and chronic illness and disability.

As medicine faces this complex and heavy burden of day-to-day illness and disability, it is clear that the public health of the future (that is, our hope of preventing or diminishing the effects of illness) becomes early and adequate medical care—preventive, diagnostic, and therapeutic. This calls for the ready availability of competent physicians and other health personnel in adequate numbers, and of appropriate physical facilities within reach of the patient.

I need not repeat here the story of rural inadequacies. We are all aware of the gross lacks in health workers and in facilities, and of the steady downhill trend in the supply of rural doctors that nothing so far has interrupted or reversed. I need not review the overwhelming evidence as to the low volume of medical services received by rural people. I simply want to address my remarks to a few basic problems which I am certain are of real concern to this group. These observations are the outgrowth of considerable study in this field and of almost 10 years of full-time effort directed toward helping farmers solve some of these problems through voluntary health insurance. First,

I want to touch on the fundamental question of rural purchasing power and the medical purchasing power of farm families.

Passing over the strikingly low farm income figures revealed by the 1939 Census of Agriculture, and coming up to more recent years when the war was having a marked influence on farmers' incomes, we find that in 1941 half of all farm operators had annual net cash incomes of less than $760 per family, including income from all nonagricultural sources.

As the war went on, farm income, of course, soared to unprecedented heights. Nevertheless, the war did not eliminate the disparity between farm and city income levels. In 1943, when farm income was approaching its peak, the total net income from all sources of persons on farms, 17.5 billion dollars, was only 12 percent of the national income of 148 billion dollars, although farm people made up 20.5 percent of the population that year. The per capita net income of all persons in the United States not living on farms, moreover, was over two and a half times as high as per capita net farm income. These figures give small comfort or assurance that the pull of the cities, drawing much that is best from rural life, will of itself be relaxed or reversed in the forseeable future.

The purchasing power of whole States becomes significant in any plan for tackling the medical care problem on a voluntary or even on a State-wide compulsory basis. There is an almost mathematical relationship between the proportion of rural people in a State and the State's per capita income. In fact, each 10 percent by which a State was rural in population in 1940 meant about $100 per capita less in the income of its citizens. Thus Illinois, with a population 74 percent urban, had a per capita income of $727; Ohio, with a population 67 percent urban, had a per capita income of $644; and Indiana, 55 percent urban, had a per capita income of $542. Dropping on down to the more rural States as further illustration of this striking relationship between rurality and income, we find that Nebraska, which was about 40 percent urban, had a per capita income of $432; Georgia, 34 percent urban, $316; and Mississippi, just 20 percent urban, $203. The implications of these income figures are obvious in terms of the efforts which can be made within individual States to make comprehensive medical services available to their people.

So far as rural medical purchasing power is concerned, as contrasted to general purchasing power, it is revealed perhaps most readily in the annual expenditures per person for medical care by median income families. Studies show that in 1941, median income urban families spent $26.76 per person for medical care, while median income farm families spent $14.37 per person, or hardly more than half the urban expenditure.

It is not surprising that there is so close a relationship between purchasing power and the distribution of physicians, dentists, and nurses, and of general and other types of hospital beds. It is perfectly clear that modern medical services of high quality cannot be provided without adequate resources in personnel and facilities. It is clear also that these essential health resources will become available only when the underlying economic factor is recognized frankly and dealt with effectively.

Before we set out to solve the whole problem of payment for medical services on a voluntary basis, we must not only face these cold factual income and expenditure figures, but we must remind ourselves that fewer than 5 percent of the whole population now receives general medical services on a prepayment basis. Less than 3 percent of all farm people are covered even by Blue Cross hospitalization, and taking whole States, the States which are over 70 percent rural had just 4.2 percent of their population in Blue Cross plans last July 1, as against 18.7 percent in the States over 70 percent urban. We must note, too, that in voluntary plans offering general medical care—aside from those sponsored by the Department of Agriculture—the greatest urban-rural disparity is found with respect to medical care insurance sponsored by medical societies. As of 1945, medical society plans covered 3 percent of the population of the 20 States that are over 50 percent urban, but in the 28 predominantly rural States, they covered only one-half of 1 percent of the population.

Before we look at the voluntary prepayment approach with optimism, we must ask ourselves frankly how many farm families can afford to join comprehensive medical service plans. There is general agreement, I believe, that a plan offering physicians' and specialist care, hospitalization, dental services, and prescribed drugs, would cost at least $100 for a family of average size. Studies show that farmers had to have net cash incomes averaging well above $2,000 in 1941 before they made average expenditures of $100 or more for medical care. The fact is that not more than 20 percent of all farm operators had such incomes in 1941, counting income from all sources. The proportion of farmers able to afford an adequate plan has doubtless increased since 1941, but there is no question that the great majority of farm families throughout the Nation simply cannot afford to purchase adequate health protection on a voluntary prepayment basis.

I shall not go into the other serious weaknesses of voluntary health insurance or the lessons gained by first-hand experience—the low participation, the turn-over, the adverse selection of risks, the resulting high cost for the services offered, the frustration of seeing the clear need for improved rural health resources and yet tackling formidable

barriers with insufficient ammunition and forces, the experience of using heavy subsidy and yet not overcoming most of the weaknesses inherent in the voluntary approach, the discouraging experience of watching rural downhill trends extend progressively on and down, most important, the sense of futility in seeing voluntary plans based on existing inadequate patterns of facilities, personnel, and organization—plans which simply lack the power of maintaining better physical facilities, of attracting more competent or more specialized personnel, or of stimulating a more effective organization of medical services.

To my mind, we have a choice to make. Each road we may choose has its toll. One road winds for a time through the field of voluntary health insurance. Although this road is an improvement over the past, its toll is one we should calculate honestly. It has its cost in almost certain failure to bring anything approaching maximum health opportunity to the majority of our 57 million rural citizens. There is also a hidden cost behind these phrases that we must face. There are people living out over this broad land—people on farms and in villages, people whose babies get sick, whose children break arms and legs, who get every physical and mental disorder known to American medicine. These people want competent physicians nearby; they want a modern hospital within reach; they want certain specialists closer than the metropolis 200 miles away. And they want a simple and sure method of paying their share for the support of these essential resources. I, for one, am unwilling to say to representatives of the farm population that these objectives are utopian. On the contrary, they are realistic, they make sense, and they are attainable. But it will take more than the road winding through the tempting pastures of voluntary health insurance to reverse the inexorable trends dictated by economic laws. We may choose this first road—for 5 years, for 8 years, or for 10 years—but if we do, let us count the cost along with any gain.

There is another road we can choose today, the road charted by President Truman. It is broad and it is direct—the way of compulsory health insurance. In one sweep it cuts through the economic barrier, bridges the uncertainties of individual medical costs, and stretches out into the future a solid economic foundation for all the challenging measures we can devise to build good health. This road also has its toll, but of a different sort. If we choose this road, the cost we shall pay will be found largely in the taxing of our minds and our imaginations to build, and build promptly, on the solid and unaccustomed economic base the system will provide.

Think for a moment what it would mean if we had this central core of national health legislation. Medical purchasing power would be spread evenly, the country over. Hospital planning and construc-

tion proposals would suddenly have real meaning for rural people, for hospitals could be placed where needed once their maintenance was assured. The urban-rural double standard would be wiped out—rural people would be assured the number of hospital beds they need and not just those they can support today. Something like $10 per person would suddenly become available to pay physicians' bills each year—$10,000 for every 1,000 rural people, $20,000 for every 2,000 people. Think of the opportunities this would create in hundreds of underserved rural counties. Picture the flow of veteran physicians and new graduates into rural districts under these changed economic circumstances and with the assurance of hospital or health center facilities.

Of course there would be problems, too—questions of training sufficient personnel, of working out patterns for continuing professional education, of affording wider opportunities for research; problems relating to the intelligent organization of medical services, the role of voluntary agencies and medical cooperatives within the system, the progressive elevation of standards, the acceptance by the medical profession of responsibility for the quality of care. Herein lies the challenge—the challenge of facing and overcoming these problems into which the medical profession and other leaders should throw their full energy and their best thinking. It is a challenge which cannot be met head-on while our force is expended in halfway efforts to solve only one problem—the problem of payment for medical services.

The American farmer and his family want to choose the road that will lead them as smoothly and rapidly as possible to health security. Farm leaders have a responsibility to see that farmers know all the facts when they make their choice. They should know all the strong and weak points about voluntary prepayment plans. They should know the facts, too, about the President's program. They should know that the day-to-day administration of the President's program will be local. They should know that in this program local people and their doctors will serve as consultants in their localities. They should know that, as always, they would choose their own doctors and their hospitals. And they should know the cost of either course in terms of money. Under the President's proposal for a national health program, the farm family would pay from 3 to 4 percent of net income for personal health services. The average percentage of net cash income spent by farm families in 1941 (for inadequate services) was actually 8.7 and the percentage spent by low-income farmers was higher yet. It seems unlikely that farmers will miss the point or will fail to recognize the clear advantage to farm people and to entire rural States of pooling the resources of the whole Nation to tackle this problem.

The public health is the sum total of individual health. The costs of adequate health services for the whole population should be borne by all of us. Good health care—Nation-wide—is a goal that is within our reach. It is a challenging goal that is many sided, but only the faint in heart will fail to take it up.

HOMOLOGOUS SERUM JAUNDICE

EXPERIMENTAL INACTIVATION OF ETIOLOGIC AGENT IN SERUM BY ULTRAVIOLET IRRADIATION [1]

By JOHN W. OLIPHANT, *Senior Surgeon*, and ALEXANDER HOLLAENDER, *Senior Biophysicist, United States Public Health Service*

In previous papers (1), (2), results of ultraviolet irradiation experiments on the inactivation of two icterogenic serums and one lot of icterogenic yellow fever vaccine containing serum were presented. The amounts of radiation used varied widely in the three experiments and it seemed advisable to try to estimate within more narrow limits the amount of energy required for inactivation.

A supply of dried pooled serum known to be icterogenic was kindly furnished by Dr. Chester S. Keefer, Medical Administrative Officer, Committee on Medical Research, who obtained the material from England through the Office of Scientific Research and Development. The serum was reconstituted to its original volume by the addition of sterile distilled water.

Irradiation Procedure.

Bacteriological Control

The material was irradiated in a 50-cc. round-bottom flask made of transparent fused quartz. Sixteen cubic centimeters of serum was introduced in such a manner that no material touched the neck of the flask which was then stoppered tightly, attached to a "slow" motor, which held the flask at an oblique angle, and rotated at about 50 r. p. m.

In general, when proteins are irradiated with ultraviolet in quartz containers, the tendency of the protein is to form a layer of coagulum which sticks tenaciously to the quartz, and has high absorption for ultraviolet under 3,000 A°, thus reducing the radiation penetrating to the remaining serum. The 50-cc. flasks were supplied with 16 cc. only and rotated at such an angle that the upper one-third to one-fourth of the flask did not come in contact with the liquid. This last point is quite important because it is necessary that the ultraviolet penetrate the quartz without obstruction and that a fresh surface is offered continuously to radiation by the rotating liquid. The above arrangement fulfills at least partially this condition.

[1] From the Division of Infectious Diseases and the Industrial Hygiene Research Laboratory, National Institute of Health.

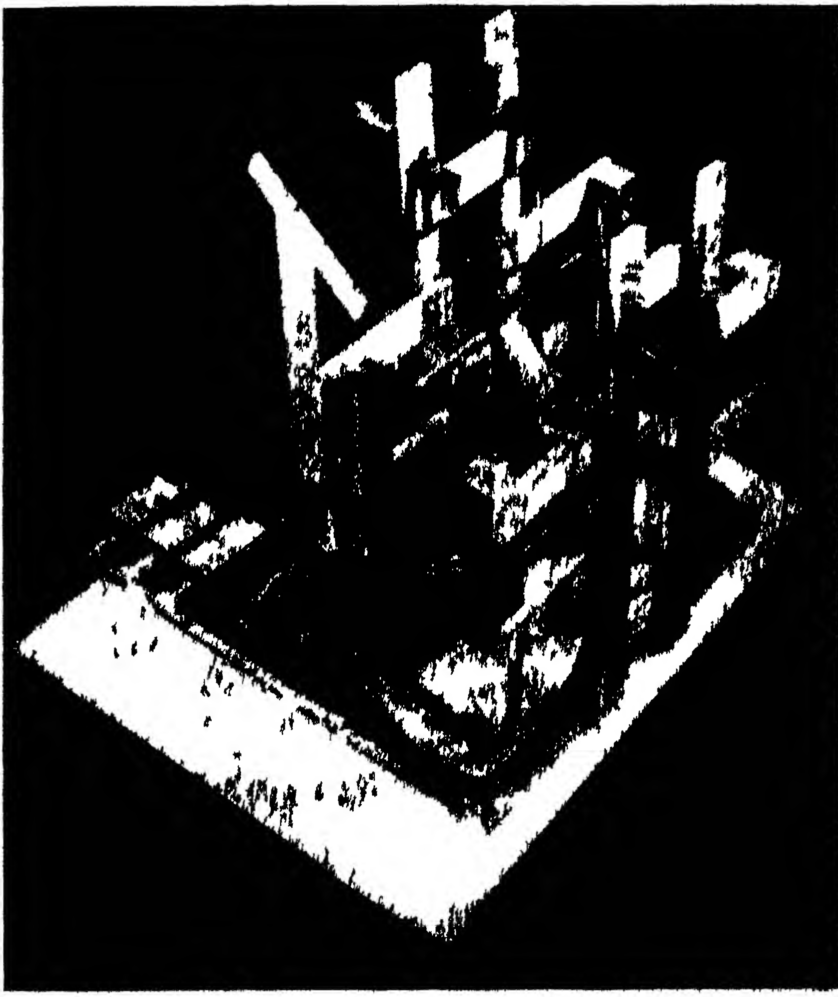

FIGURE 1 —Apparatus for the irradiation of serum with λ 2537 A Eight 8-watt low-pressure mercury vapor lamps with glass envelopes surround a rotating 50 cc fused quartz flask with 16 cc of serum The flask is exposed from all sides to ultraviolet radiation The upper part of the flask which does not come in contact with the serum permits the direct irradiation of the fresh surfaces which the rotating liquid presents

Eight 8-watt low-pressure mercury vapor lamps with special glass envelopes which emit about 80 percent of their total radiation at wave length 2537 A were used as radiation sources. The lamps were arranged in two groups forming two quadrangles in which the flask revolved and was exposed practically from all sides to ultraviolet radiation (see fig. 1). The flask was cooled by a strong stream of air from a fan to avoid heating the serum to higher than room temperature.

There is no simple direct way to determine the amount of energy each individual serum or virus particle receives. However, there is an indirect way to estimate the energy received by each particle of about $1\mu^3$. The method consists in irradiating bacteria of known sensitivity in the serum under standard conditions and plating them out in nutrient agar after certain time intervals of exposure for the determination of survival ratios. The organism used in this case was *Aerobacter aerogenes*, which could readily survive in the serum for the time of the test if protected against the ultraviolet.

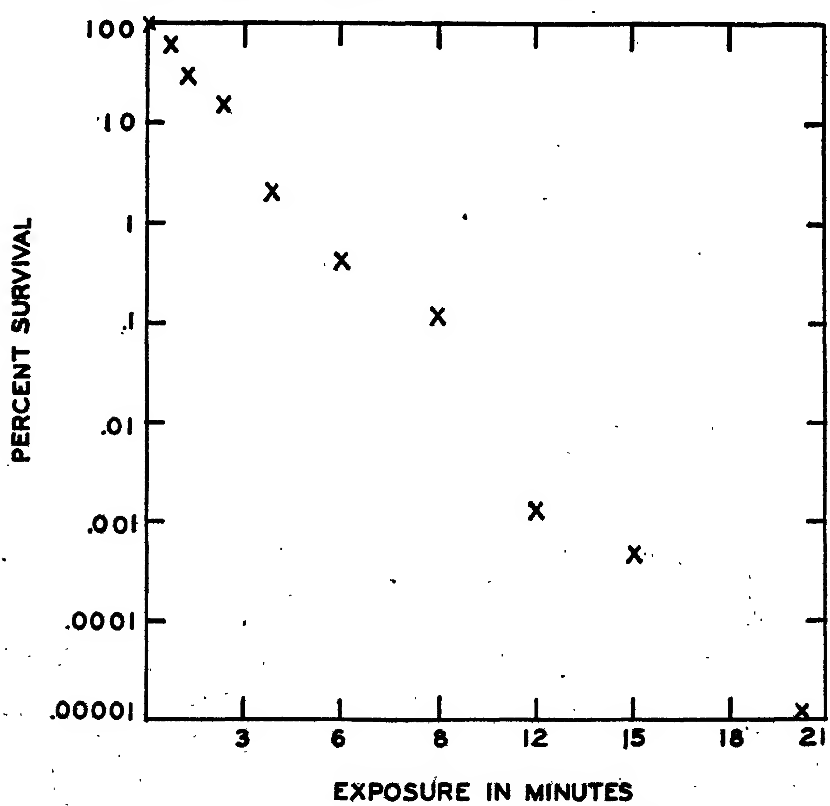

FIGURE 2.—Survival of *Aerobacter aerogenes* in jaundice serum irradiated with 2537 A. This serum came from the same batch as the serum which was tested for survival of virus. (Original concentration of bacteria 22,000,000 per milliliter.)

A. aerogenes was incubated for 4 days at 37° C. on Difco meat-peptone agar. The bacteria were washed off with physiological salt solution, shaken to break up clumps, and filtered through absorbent cotton. The bacteria were added to the serum so that each milliliter contained about 20,000,000 bacteria. The material was well mixed in the irradiation flask and two samples removed, one for the immediate plating and one to be kept in the dark at room temperature to be plated out at the end of the experiment. At certain time intervals during irradiation 1/10-cc. samples were removed, diluted, and plated out. At least three plates were poured for each dilution and as many as three dilutions were plated for each exposure. Plates showing between 20 and 300 colonies per plate were counted and the average per three plates plotted (see fig. 2). The points for 15- and 20-minute exposures are less reliable than those for shorter intervals because the number of colonies per plate was too low.

It takes about 80×10^{-5} ergs per organism to kill 99 percent of *A. aerogenes*, if irradiated in physiological salt solution. If we accept *A. aerogenes* to be $1\mu^3$ in volume, then each particle of $1\mu^3$ in the serum has received approximately 80×10^{-5} ergs in 5 minutes. (Hollaender, Andrews, and Oliphant, are preparing a paper giving further details of technique and precautions necessary in this work.)

Four groups of 12 persons each, aged 16 to 40 years, of either sex, in apparently normal health, were inoculated as follows:

GROUP 1. Nonirradiated serum control group, serum diluted 1:4 with M/15 phosphate buffered normal saline solution pH 7.6, dose 0.5 cc. subcutaneously into the deltoid region.

GROUP 2. Dosage and dilution of serum as in group 1. Irradiation time 1 minute.

GROUP 3. Dosage and dilution of serum as in group 1. Irradiation time 6 minutes.

GROUP 4. Dosage and dilution of serum as in group 1. Irradiation time 30 minutes.

These individuals were then bled weekly for 161 days. Quantitative Van den Bergh estimations and cephalin cholesterol flocculation tests were done on each serum specimen on the day of bleeding.

Cases of hepatitis observed in the four groups were as follows:

Group	Number of subjects	Serum irradiation time (min.)	Serum dose, Sc.[1]	Serum dilution	Number of cases hepatitis	Incubation period[2] (weeks)
1	12	0	0.5 cc	1:4	4	12, 13, 13, 13
2	12	1	0.5 cc	1:4	0	
3	12	6	0.5 cc	1:4	1	12
4	12	30	0.5 cc	1:4	0	

[1] Sc.=subcutaneous injection of serum diluted after irradiation.
[2] Period between inoculation and rise of serum bilirubin above 1.0 mg. per 100 cc.

As to severity of the hepatitis, only two of the patients were ill enough to require bed rest for short periods while jaundiced. The highest Van den Bergh readings found in the four cases in group 1 were 1.4, 5.6, 8.0, and 10.0 mg. per 100 cc. In the one case in group 3 the highest reading found was 3.3 mg.

Discussion

The results of this experiment are statistically significant. The hepatitis incidence was 30 percent in the control group as compared with an incidence of 0, 8.3, and 0 percent in the three groups inoculated with irradiated material. The end point of irradiation at which complete inactivation of the icterogenic agent would occur (under the conditions of this experiment) would seem to be at some point in excess of 6 minutes.

It is possible, of course, that the factors of titer of the icterogenic agent and the dose of serum given would have an influence upon the "icterogenic capacity" of irradiated material.

In three previous experiments (*2*), three specimens, including yellow fever vaccine and two human serums, produced jaundice in normal control groups while the same materials irradiated for varying periods of 1 to 30 minutes produced no jaundice in test groups of comparable size.

It would seem, therefore, that the etiologic agent of homologous serum jaundice is susceptible to inactivation by ultraviolet irradiation. This suggests the possibility that ultraviolet irradiation might be useful as a routine procedure in processing potentially icterogenic human serum or plasma.

It has been found (*1*), (*2*), (*3*), (*4*), that the serum of persons during the "incubation period" of infectious hepatitis or "homologous serum jaundice" may contain the icterogenic agent. There is at present no means for detecting the presence of the agent in blood other than by human inoculation. There is an ever-present danger in the use of human blood, plasma, or serum that the agent of infectious hepatitis may be encountered. Since the agent is filterable and quite resistant to heat, preservatives, drying, and ordinary storage conditions, (*1*), (*2*), ultraviolet irradiation appears to be the most practical method available at present for inactivating the agent in blood products.

Prophylactic irradiation would probably find its chief use in processing human immune serums and "normal" human serum before incorporation into vaccines.

Immune serum irradiation brings up the question of possible destruction of serum antibodies. Different kinds of antiserums, both

antiviral and antibacterial, have been irradiated for varying periods in the same apparatus described above, and found to be quite resistant to heavy doses of radiation. This work will be described in a subsequent paper.

Summary

Dried human icterogenic serum was reconstituted and irradiated with ultraviolet light for periods of 1, 6, and 30 minutes. Each irradiated specimen was inoculated subcutaneously into 12 individuals in doses of 0.5 cc. in dilution of 1:4. A control group of 12 received the same dose of nonirradiated serum.

Subsequently 4 cases of jaundice appeared in the control group after 12-, 13-, 13-, and 13-week intervals. One case of jaundice occurred after 12 weeks in the group receiving material irradiated for 6 minutes.

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INSTRUCTIONS FOR USING ANTU AS A POISON FOR THE COMMON NORWAY RAT[1]

By Curt P. Richter and John T. Emlen, Jr.

INTRODUCTION

These instructions are intended for workers in the field of public health who are concerned with city- and country-wide problems of rat control. For this reason the emphasis has been placed on large scale control operations. No special merits are claimed for the poison alpha-naphthyl thiourea (ANTU) for this purpose. Other poisons might give as good or better results. ANTU has, however, already been given a severe test as the exclusive poison over a long period of time in a large city experimental campaign.

Rat Control Is a Community Problem

ANTU was tested for its efficiency and safety over a 3-year period in a city-wide rat-control campaign in Baltimore, Md. During this

[1] From the Psychobiological Laboratory, Johns Hopkins Medical School; and the Sub-Department of Rodent Ecology, Johns Hopkins School of Hygiene. (The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the Johns Hopkins University.)

period more than 50 tons of poisoned baits were distributed in over 150,000 private yards, homes, and stores. Over a thousand Baltimoreans handled the poisoned bait. No persons were poisoned and the rat population was reduced on the average about 90 percent or better in treated areas.

At the same time ANTU was tested by the United States Fish and Wildlife Service, the United States Public Health Service, and by several professional exterminator companies with good results. It has been tested also in England and Australia.

Experience gained in the extensive campaign in Baltimore indicated clearly that the control of rats depends not only on the use of an efficient poison, but also on a systematic poisoning program and procedure. A few general principles may be emphasized at the beginning:

1. Poisoning operations should not be attempted on a small scale. It is unwise to use poison in a single house or building which is surrounded by a rat-infested area unless the house or building is well ratproofed.

2. In community programs in urban areas it is recommended that no less than an entire block be treated with poison at one time. The four streets surrounding a block form natural boundaries to most local rat movements.

3. A city block can be treated with poisoned bait in several hours by two to four men at small cost. If care and thoroughness are emphasized a single poisoning operation will kill 90 to 100 percent of the rats. Every effort should be made to kill the last rat. Some blocks that have been freed of the last rat have remained free for several years even though they were surrounded by infested blocks.

4. In rural areas a whole farm should be baited at one time, at least those parts of it which afford food and harborage to rats.

5. In a large-scale poisoning program, involving large parts or all of a town or city, preparations must be made for a well-planned attack. Before starting operations the cooperation of the mayor and health officers should be sought, workers should be organized, and an effective publicity campaign instituted to inform and arouse all citizens. At the same time the groundwork should be laid to keep the poisoned area under permanent surveillance.

6. Whether for a small- or large-scale program the work can be done by exterminator companies, paid crews of city employees, or volunteer groups of citizens belonging to various social or civic organizations, or by a combination of these.

7. Thoroughness is of primary importance in baiting. In working in a block, every single house, yard, and cellar should be inspected and baited wherever necessary. An overlooked colony of rats may quickly reinfest the entire block.

8. The permanent surveillance is of great importance since any house, block, or district, no matter how thoroughly freed of rats, is subject to reinfestation so long as rats still exist in the vicinity, or can be brought in by freight cars, trucks, or moving vans. ANTU of course does not protect against reinfestation.

What is ANTU?

ANTU is a highly specific poison for the Norway rat—the rat most commonly found in cities, towns, and on farms, in the United States and in most other countries. It kills a smaller percentage of roof or Alexandrine rats and house mice and so is not recommended for killing these animals. It does not poison chickens, pigeons, rabbits, guinea pigs, or squirrels. It can kill dogs and cats, but it does so infrequently since in most instances the animals vomit before the poison is absorbed. So far as is known at present it probably is nontoxic to man except in large amounts.

ANTU comes in the form of a fine bluish-gray powder (particle size 20–100 microns). It is highly insoluble, stable to heat, and deteriorates very little if at all during several years' dry storage. It has no perceptible odor, and only a very transient bitter taste.

ANTU mixes evenly with all kinds of food (or ground grain) and adheres well to dry or wet foods when dusted on them. It sticks to the feet and hair of rats when the rats run through it. It dusts well from insect dust sprayers and pump guns such as used for cyanogas powder.

ANTU kills through the stomach, not through contact with the skin. Rats die when they eat it in their food or lick it off their feet and hair.

ANTU acts chiefly on the lungs. Within a few hours after poisoning the lungs and the thoracic cavity become filled so that the rats drown in their own fluid. They die usually within 10 to 24 hours. Their breathing difficulties drive them to the outside.

ANTU is a single-shot poison; it is not an accumulative poison. Everything depends on getting a fatal amount of poison into the rats at the first meal, since after eating a sublethal dose they develop a tolerance which lasts about 30 days and an aversion which may last several months.

How To Use ANTU

1. In ground baits

Thoroughly mix 2 or 3 parts of ANTU with 100 parts of finely ground grain, preferably a high grade of yellow corn. Distribute in small shallow piles.

2. Dusted on baits

Place freshly ground yellow corn or other grains in small piles on floor or earth and smooth out to a flat thin layer about ¼ inch

in thickness. Dust the grain and surrounding areas for 6 inches with ANTU, using a small spray gun, duster, or shaker. Use diced apples, sweet potatoes, tomatoes, cantaloupes, watermelons, ground meat, the white and yolk of eggs, and fish or chicken heads in the same manner.

Dust ANTU on fresh ears of corn, the kernels of which have been slit by running a sharp knife lengthwise along the cob. Cut the cob into 1-inch sections and distribute. (Very useful for distribution in inaccessible places.)

3. Dusted on floor and on runways without baits

Spread a 50 percent mixture of ANTU and flour over ground in areas which rats frequent, especially along runways and near openings.

4. Pumped in burrows

Pump ANTU powder (or flour-ANTU mixture as in No. 3) into openings of rat burrows with foot or hand duster until floor of burrow is well coated.

5. Dusted on water or mixed with water

Use small shallow cups or dishes. Dust ANTU on water until it forms a thin film on surface; or put 1 to 2 parts of ANTU with 100 parts of water in a bottle, shake well, and pour into a shallow dish. After being shaken up with water the powder tends to settle within a few hours so that repeated shaking or stirring may be necessary.

For best results use several methods (at least Nos. 1, 2, and 5) at the same time. Try to provide an excess of bait for all suspected rats, but do not throw bait around carelessly. Make the rat's first poisoned meal its last meal.

Use those baits that are most attractive to local rats during the season of poisoning operations. Yellow corn is practically a complete food and is almost universally attractive, used either when freshly ground or fresh on the cob.

In grocery stores or other places where food is available at all times make liberal use of poisoned water.

Where To Use ANTU Baits

1. Place poisoned baits near feeding places, especially garbage pails and food-storage places, or in sheltered spots where rats can eat without being disturbed.
2. Near sources of water for rats.
3. Near burrow entrances and harborage sites.
4. Along runways.

Distribute bait liberally wherever rats have been seen or suspected at any time.

When To Use ANTU

1. Distribute poisoned baits, particularly poisoned water, late in afternoon if possible.
2. Spring, summer, and early fall appear to be the most favorable times of the year for poisoning operations.

How To Prepare for Use Of ANTU

1. Make a survey of the area to be poisoned—the buildings, houses, cellars, yards, and alleys, for signs of rats.
2. Especially when yellow corn or equally attractive baits are not available, it may be desirable to pre-bait with unpoisoned baits for several days to make certain that the rats will eat the bait freely.
3. See that all food available to rats (especially food for dogs, cats, and birds) is removed if possible 24 hours before ANTU-treated baits are distributed.

Precautions To Be Observed

1. Warn all individuals within areas to be poisoned to keep children away from baits and to leash dogs.
2. Use only grain baits in places which dogs and cats frequent.
3. Coloring baits with an insoluble pigment (such as du Pont chrome green G-550-D) will reduce the possibility of poisoned baits being mistaken for food.
4. When poisoning operations are over, take up all uneaten baits and dispose of them in some place inaccessible to pets.

How To Check Results

1. Look for dead rats for several days following poisoning. In cold weather few rats die on the surface.
2. On the third day close all rat holes with dirt or stones and sweep up or stamp out all fresh droppings. If any rats remain the holes will be reopened within a few days.
3. Look for fresh droppings on runways.
4. Dust flour on runways to show up fresh tracks.
5. Have everyone watch for rats and report to local rat inspectors.

Schedule for Poisoning an Entire Block, a Group of Blocks, or a Farm

Preliminary work.—Discuss situation with all people who are involved, organize workers, plan your attack. (See introduction.)

First day

1. Notify and caution all persons within the area and tell them the approximate time of the poisoning.

2. Make survey to locate all infested places, indoors and outdoors.
3. See that all uncovered garbage, exposed food, and sources of water are removed.

Second day

Distribute poison.

Fourth day and thereafter

1. Remove poison; close burrows. Sweep up droppings.
2. Check for fresh rat signs. Recheck at monthly intervals.
3. If rats remain or reappear, trap or kill with cyanogas. Keep after them and try to eliminate the last rat.
4. Repeat ANTU treatment once a year if necessary.
5. Institute sanitary measures insofar as possible to eliminate rat harborage and sources of food for rats.

In Case of Accidental Poisoning of Human Beings or Pets

1. Call a doctor or veterinary.
2. Induce vomiting or pump out stomach.
3. Treat for shock.
4. Keep warm.
5. Use positive pressure oxygen inhalation if available.

For the Doctor's Information

The symptoms of poisoning in dogs as well as rats are:

1. Drop in body temperature, increase in blood sugar.
2. Dyspnea, pulmonary edema, and pleural effusion which develop within 1 to 3 hours.

STUDY OF CHILD HEALTH SERVICES BY THE AMERICAN ACADEMY OF PEDIATRICS

A Nation-wide study of child health services to stimulate local groups to ascertain the needs of their own communities and the existing facilities to meet them has been launched under the joint sponsorship of the American Academy of Pediatrics, the United States Public Health Service, and the United States Children's Bureau.

The project represents a cooperative attempt on the part of private and official medical and health organizations to discover the facts about medical care for children as a basis for future planning. The responsibility for the actual conduct of the study is the Academy's, but both of the Federal agencies are contributing to its success by providing the services of expert medical and statistical personnel.

Of equal importance to the success of the study will be the part played by official health agencies and other official groups in the States in supplying data and promoting the study.

The study grows out of a resolution adopted by the Academy "to make available to all mothers and children of the United States all essential preventive, diagnostic, and curative services of high quality, which, used in cooperation with other services for children, will make this country an ideal place for children to grow into responsible citizens."

A first step toward this objective is the assembling of information on every aspect of public health and medical care for children. A vast amount of data will be required before community planning can be undertaken on a sound basis.

Data will be collected from hospitals and institutions, official and voluntary health agencies, and physicians and dentists engaged in practice relating to child health. The information will be collected on a State basis by personal visits and questionnaire schedules. Each State program will be under the supervision of the State chairman of the Academy of Pediatrics, who, aided by an executive secretary and assistants, will be responsible for the administration and coordination of the study in his State.

An important aspect of the study is the collection of information concerning local official and voluntary health services for children, including well-child conferences, school health programs, dental clinics, and public health nursing activities. The American Academy of Pediatrics has formally requested the support and assistance of all public health officials—State, district, and local—to insure the success of the study. This request, addressed by a national medical organization of high standing to governmental agencies, represents another milestone in cooperative action. It affords the opportunity for the two groups to combine their resources and abilities for the successful completion of an important study.

Considerable progress has already been made. A "pilot" study has been completed in North Carolina affording much valuable experience in testing proposed procedures. Preliminary steps have been taken in some 30 States and the District of Columbia toward setting up individual State programs. Many State health officers have already been approached; others will shortly receive information and visits from State chairmen.

DEATHS DURING WEEK ENDED MAR. 30, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 30, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	9,426	9,112
Average for 3 prior years	9,507	
Total deaths, first 13 weeks of year	132,127	125,811
Deaths under 1 year of age	632	693
Average for 3 prior years	639	
Deaths under 1 year of age, first 13 weeks of year	7,848	8,336
Data from industrial insurance companies:		
Policies in force	67,191,152	67,166,267
Number of death claims	13,568	13,044
Death claims per 1,000 policies in force, annual rate	10.5	10.1
Death claims per 1,000 policies, first 13 weeks of year, annual rate	11.3	10.9

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 6, 1946

Summary

Of the 13 cases of smallpox reported for the week, 17 occurred in Washington and 4 in California. (See p. 617.)

For the second consecutive week, following 3 weekly increases, the incidence of diphtheria declined. A total of 314 cases was reported, as compared with 327 last week and a 5-year (1941–45) median of 219. Of the current total, more than reported for the corresponding week of any of the past 6 years, Texas reported 36 and New York 29. The total to date, 5,252 (as compared with 4,234 for the corresponding period last year and a 5-year median of 4,127), is more than reported for the corresponding period of any year since 1939.

Of a total of 38,233 cases of measles, as compared with 35,676 last week and a 5-year median of 25,377, more than half occurred in the Middle Atlantic and East North Central areas. The 5 States outside of these areas reporting more than 750 cases each (Massachusetts, Kansas, Texas, Colorado, and California) reported an aggregate of 9,889 cases. The total to date is 260,450, as compared with 36,200 for the corresponding period last year and a 5-year median of 235,785.

A total of 158 cases of meningococcus meningitis was reported for the week (as compared with 149 last week and a 5-year median of 191), of which 27 occurred in New York, the only State reporting more than 11 cases. The cumulative total to date is 2,706, as compared with a 5-year median of 3,423.

Of the total of 28 cases of poliomyelitis (as compared with 32 for the corresponding week of last year and a 5-year median of 19), only 2 States, New York and Montana, with 3 cases each, reported more than 2 cases. The total for the year to date is 546, as compared with 485 for the same period last year and a 5-year median of 353.

A total of 9,037 deaths was recorded for the week in 93 large cities of the United States, as compared with 9,461 last week, 9,121 and 9,295, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,367. The cumulative figure is 141,698, as compared with 135,364 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Apr. 6, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended— Apr. 6, 1946	Week ended— Apr. 7, 1945	Median 1941–45	Week ended— Apr. 6, 1946	Week ended— Apr. 7, 1945	Median 1941–45	Week ended— Apr. 6, 1946	Week ended— Apr. 7, 1945	Median 1941–45	Week ended— Apr. 6, 1946	Week ended— Apr. 7, 1945	Median 1941–45
NEW ENGLAND												
Maine	4	0	0	2	1	1	26	4	151	0	1	1
New Hampshire	0	0	0	1	------	------	17	13	26	0	0	0
Vermont	0	0	0	------	------	------	10	1	57	0	0	0
Massachusetts	6	8	6	------	------	------	1,463	154	759	5	4	5
Rhode Island	0	0	0	2	------	------	------	5	14	0	2	1
Connecticut	2	2	1	3	2	3	263	147	341	3	2	6
MIDDLE ATLANTIC												
New York	29	19	18	(1)	[1] 1	[1] 10	4,595	118	2,756	27	22	22
New Jersey	3	5	5	------	2	11	3,477	86	1,411	7	9	9
Pennsylvania	19	8	11	2	3	2	3,511	263	1,068	6	12	15
EAST NORTH CENTRAL												
Ohio	19	5	5	4	4	11	734	86	925	9	13	8
Indiana	9	5	6	49	4	15	987	24	226	4	4	4
Illinois	18	2	17	28	1	12	1,229	147	932	8	19	17
Michigan [2]	3	6	5	------	1	5	2,800	73	848	6	6	6
Wisconsin	0	3	3	36	6	42	2,840	42	1,627	4	5	4
WEST NORTH CENTRAL												
Minnesota	5	0	2	2	1	2	39	17	141	0	3	1
Iowa	6	4	4	------	------	------	81	36	221	2	3	0
Missouri	7	1	3	1	------	2	384	16	299	4	3	3
North Dakota	1	1	1	------	5	3	6	3	33	0	0	1
South Dakota	5	0	1	------	------	------	31	26	19	1	1	0
Nebraska	1	0	3	2	8	7	708	26	146	0	2	0
Kansas	5	4	3	------	4	5	1,035	26	566	6	5	2
SOUTH ATLANTIC												
Delaware	0	5	0	------	------	------	52	7	8	0	1	1
Maryland [2]	19	10	2	8	2	9	614	35	344	1	4	9
District of Columbia	0	0	0	------	------	------	284	7	134	1	2	1
Virginia	4	3	8	215	207	323	686	71	559	5	2	5
West Virginia	3	2	5	4	16	16	100	63	184	0	4	1
North Carolina	8	5	5	------	------	18	577	39	825	7	2	2
South Carolina	5	7	7	239	318	402	381	34	207	0	5	5
Georgia	5	2	3	8	11	52	159	35	177	1	2	2
Florida	5	0	2	2	------	11	149	38	196	4	1	1
EAST SOUTH CENTRAL												
Kentucky	8	6	6	5	1	4	255	12	112	4	1	3
Tennessee	3	8	5	22	11	57	252	17	252	4	5	5
Alabama	7	4	5	37	39	107	190	12	213	3	7	7
Mississippi [2]	5	7	2	------	------	------	------	------	------	5	2	6
WEST SOUTH CENTRAL												
Arkansas	4	2	4	45	50	76	153	39	169	2	2	2
Louisiana	3	2	2	51	18	11	288	19	170	3	2	2
Oklahoma	3	2	5	34	151	137	402	60	66	2	2	2
Texas	36	31	36	906	931	931	2,666	485	1,150	7	16	16
MOUNTAIN												
Montana	2	2	2	4	6	8	45	16	76	0	1	0
Idaho	1	1	1	18	------	------	78	14	28	0	0	0
Wyoming	1	0	0	------	------	1	58	10	72	0	0	1
Colorado	4	4	7	13	21	35	1,091	19	293	0	0	1
New Mexico	0	0	1	3	------	------	11	23	46	0	0	0
Arizona	15	1	1	73	79	98	228	13	98	2	0	0
Utah [2]	0	0	0	8	56	26	522	212	212	1	0	0
Nevada	0	0	0	------	------	------	3	1	1	0	0	0
PACIFIC												
Washington	4	3	3	------	2	3	732	269	349	3	5	3
Oregon	10	7	1	3	20	16	387	59	156	0	1	2
California	17	27	21	41	14	74	3,634	1,057	1,057	11	8	8
Total	314	214	219	1,871	1,996	3,032	38,233	3,979	25,377	158	191	191
14 weeks	5,252	4,234	4,127	177,855	53,151	64,484	260,450	36,200	235,785	2,706	3,423	3,423

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Apr. 6, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— Apr. 6, 1946	Poliomyelitis: Week ended— Apr. 7, 1945	Poliomyelitis: Median 1941–45	Scarlet fever: Week ended— Apr. 6, 1946	Scarlet fever: Week ended— Apr. 7, 1945	Scarlet fever: Median 1941–45	Smallpox: Week ended— Apr. 6, 1946	Smallpox: Week ended— Apr. 7, 1945	Smallpox: Median 1941–45	Typhoid and paratyphoid fever [3]: Week ended— Apr. 6, 1946	Typhoid and paratyphoid fever [3]: Week ended— Apr. 7, 1945	Typhoid and paratyphoid fever [3]: Median 1941–45
NEW ENGLAND												
Maine	0	0	0	24	71	18	0	0	0	0	0	0
New Hampshire	1	0	0	27	8	7	0	0	0	0	0	0
Vermont	0	0	0	6	16	15	0	0	0	0	0	0
Massachusetts	0	1	0	184	383	383	0	0	0	1	1	1
Rhode Island	0	0	0	5	31	21	0	0	0	0	0	0
Connecticut	0	0	0	62	82	93	0	0	0	0	1	1
MIDDLE ATLANTIC												
New York	3	6	1	789	697	610	0	0	0	2	3	6
New Jersey	0	0	0	176	200	202	0	0	0	3	0	2
Pennsylvania	1	2	1	482	514	421	0	0	0	3	3	2
EAST NORTH CENTRAL												
Ohio	0	0	0	435	409	409	0	1	0	0	0	3
Indiana	0	0	0	85	130	130	0	4	1	1	6	1
Illinois	2	2	1	177	312	312	0	0	0	0	1	1
Michigan [2]	2	0	0	159	174	227	1	0	0	2	2	2
Wisconsin	0	0	0	130	245	245	0	0	1	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	42	96	80	0	0	0	0	0	0
Iowa	0	0	0	59	56	56	0	0	1	0	0	0
Missouri	0	0	0	77	80	120	0	1	1	2	0	0
North Dakota	0	0	0	8	29	23	0	1	0	0	0	0
South Dakota	0	0	0	21	13	27	0	0	0	0	0	0
Nebraska	0	1	0	39	53	53	0	0	0	3	0	0
Kansas	1	0	0	80	93	93	0	2	0	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	9	6	7	0	0	0	0	1	0
Maryland [2]	0	0	0	174	243	139	0	0	0	0	1	1
District of Columbia	0	0	0	24	30	26	0	0	0	0	0	0
Virginia	0	1	1	97	117	58	0	0	0	2	2	2
West Virginia	0	0	0	27	44	44	0	0	6	0	2	1
North Carolina	1	0	0	47	82	34	0	0	0	0	2	1
South Carolina	0	1	1	5	6	4	0	0	0	0	1	0
Georgia	0	2	0	10	41	16	0	1	0	4	8	3
Florida	2	1	1	5	3	7	0	0	0	1	8	8
EAST SOUTH CENTRAL												
Kentucky	1	1	0	33	48	88	0	0	0	1	1	1
Tennessee	0	0	0	27	29	51	0	0	0	1	1	1
Alabama	1	7	0	3	17	18	0	0	0	2	0	0
Mississippi [2]	0	1	1	4	15	9	0	1	1	1	1	1
WEST SOUTH CENTRAL												
Arkansas	[4] 1	0	0	13	9	7	0	0	1	4	3	0
Louisiana	0	1	1	12	24	8	0	0	0	4	1	2
Oklahoma	1	1	0	14	14	21	0	0	0	0	1	1
Texas	2	0	2	43	114	76	0	0	3	8	6	5
MOUNTAIN												
Montana	3	0	0	12	21	21	0	0	0	0	0	0
Idaho	0	0	0	8	38	38	0	1	0	4	2	0
Wyoming	0	0	0	6	15	24	0	1	0	0	0	0
Colorado	2	0	0	27	69	50	1	0	0	2	0	0
New Mexico	0	0	0	6	19	6	0	0	0	0	1	1
Arizona	0	0	0	7	25	14	0	0	0	1	0	0
Utah [2]	0	1	0	20	35	35	0	0	0	0	0	0
Nevada	0	0	0	0	1	1	0	0	0	0	0	0
PACIFIC												
Washington	2	1	0	45	128	65	7	1	0	2	0	0
Oregon	0	0	0	26	30	30	0	0	0	2	3	2
California	2	2	2	180	325	144	[5] 4	0	0	4	0	2
Total	28	32	19	3,951	5,240	4,468	13	14	20	61	62	62
14 weeks	[4] 546	485	353	48,492	79,231	55,893	138	150	322	634	781	1,911

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 1; Missouri 1; Georgia 3; Louisiana 1; Oregon 1; California 1.
[4] Correction: Week ended Mar. 23, poliomyelitis, Arkansas 0 (instead of 1).
[5] 2 cases from Navy transport *Marine Devil*, onsets on shipboard; 2 cases from transport *La Salle* at Richmond.

Telegraphic morbidity reports from State health officers for the week ended Apr. 6, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Apr. 6, 1946	Whooping cough: Week ended— Apr. 7, 1945	Whooping cough: Median 1941–45	Week ended Apr. 6, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	17	49	13	1							3
New Hampshire	7										1
Vermont	5	24	24								2
Massachusetts	90	148	149								3
Rhode Island	22	11	26								
Connecticut	44	30	47	2	1						1
MIDDLE ATLANTIC											
New York	163	234	335	2	9						7
New Jersey	155	96	96	3							
Pennsylvania	97	169	231				1				
EAST NORTH CENTRAL											
Ohio	98	201	155								1
Indiana	10	8	21	2	1				1		
Illinois	111	55	81	4	2		1				7
Michigan [2]	101	54	176		1						6
Wisconsin	97	65	131								4
WEST NORTH CENTRAL											
Minnesota	7	5	45	2							1
Iowa	10	2	11								5
Missouri	17	12	18				1				1
North Dakota	2		13								
South Dakota		5	5								2
Nebraska	3	1	7								2
Kansas	31	10	36				1				3
SOUTH ATLANTIC											
Delaware	1		3								2
Maryland [2]	22	58	58			5					1
District of Columbia	6	11	14								
Virginia	32	28	76	1		28					1
West Virginia	34	54	42								
North Carolina	74	151	178						1	4	
South Carolina	53	72	69	1	12					1	
Georgia	5	19	22						1	6	6
Florida	19	5	18	1						3	
EAST SOUTH CENTRAL											
Kentucky	16	16	59								
Tennessee	28	15	41						1	1	1
Alabama	15	36	36							7	2
Mississippi [2]									2		
WEST SOUTH CENTRAL											
Arkansas	8	20	9	1	6		1		1		6
Louisiana		3	3	2	9					3	
Oklahoma	10	9	10	1							1
Texas	196	253	253	8	282	19			2	20	10
MOUNTAIN											
Montana	7	25	11								
Idaho	7	2							1		
Wyoming	1	4	2								
Colorado	29	24	30								1
New Mexico	7	10	10								
Arizona	7	24	35			17					1
Utah [2]	23	25	39								1
Nevada											
PACIFIC											
Washington	22	18	46								
Oregon	16	16	19				1				
California	54	358	358	3	1						7
Total	1,779	2,435	3,393	34	324	69	6	0	10	45	89
Same week, 1945	2,435			34	270	96	6	0	10	45	85
Average, 1943–45	2,879			24	228	62	9	[3] 1	10	[3] 40	
14 weeks, 1946	25,398			517	3,991	1,455	112	6	277	654	1,061
1945	34,076			404	6,478	1,715	99	4	256	701	1,184
Average, 1943–45	38,525		[3] 54,101	394	4,026	1,069	131	[3] 4	213	[3] 563	

[2] Period ended earlier than Saturday.

[3] 5-year median, 1941–45.

Leprosy: Texas 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 30, 1946

This table lists the reports from 86 cities of more than 10,000 population distributed throughout the United States and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
New Hampshire:												
Concord	0	0	------	0	-------	0	2	0	3	0	0	------
Massachusetts:												
Boston	3	0	------	0	356	1	7	0	48	0	0	17
Fall River	0	0	------	0	48	0	3	0	7	0	0	6
Springfield	0	0	------	0	34	0	1	0	8	0	0	2
Worcester	0	0	------	0	82	0	12	0	7	0	0	20
Rhode Island:												
Providence	1	0	1	1	5	1	4	0	2	0	0	18
Connecticut:												
Bridgeport	0	0	------	1	-------	0	0	0	9	0	0	------
Hartford	0	0	------	0	2	0	1	0	3	0	1	5
New Haven	0	0	1	0	50	0	3	0	5	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	1	346	0	10	0	15	0	0	30
New York	17	0	2	1	1,372	10	58	1	508	0	1	50
Rochester	1	1	------	0	608	0	5	0	13	0	0	1
Syracuse	0	0	------	0	126	0	4	0	6	0	0	6
New Jersey:												
Camden	0	0	------	0	96	1	1	0	1	0	0	4
Newark	0	0	1	0	1,216	1	1	0	18	0	0	23
Trenton	0	0	1	0	1	0	2	0	9	0	0	1
Pennsylvania:												
Philadelphia	3	0	2	1	806	0	23	0	89	0	1	19
Pittsburgh	1	0	1	1	5	2	7	0	22	0	1	3
Reading	0	0	------	0	517	1	2	0	4	0	0	10
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	0	137	3	8	0	6	0	0	------
Cleveland	2	0	2	1	42	1	8	0	47	0	0	25
Columbus	0	0	------	0	4	1	2	0	15	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	5	0	3	0	7	0	0	------
Indianapolis	1	0	------	0	665	0	8	0	19	0	0	11
South Bend	0	0	------	0	-------	0	0	0	6	0	0	------
Terre Haute	0	0	------	0	-------	0	1	0	1	0	0	------
Illinois:												
Chicago	2	0	1	1	708	10	31	0	107	0	0	44
Springfield	0	0	------	0	7	1	0	0	5	0	0	------
Michigan:												
Detroit	6	0	2	0	1,349	0	6	0	44	0	0	24
Flint	0	0	------	0	19	0	3	0	11	0	0	8
Grand Rapids	0	1	------	0	135	0	3	0	6	0	0	10
Wisconsin:												
Kenosha	0	0	------	0	4	1	0	0	1	0	0	2
Milwaukee	0	0	------	0	1,527	1	7	0	27	0	0	39
Racine	0	0	------	0	38	0	0	0	3	0	0	------
Superior	0	0	------	0	14	0	0	0	0	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	4	0	2	0	5	0	0	2
Minneapolis	0	0	------	0	16	0	7	0	17	0	0	------
St. Paul	2	0	------	0	2	2	3	0	11	0	0	3
Missouri:												
Kansas City	2	0	------	1	83	1	9	0	4	0	0	2
St. Joseph	0	0	------	0	8	0	0	0	0	0	0	------
St. Louis	2	0	1	0	83	0	17	0	21	0	1	2

City reports for week ended Mar. 30, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	47	1	5	0	5	0	0	------
Kansas:												
Topeka	0	0	------	0	27	0	1	0	12	0	0	3
Wichita	0	1	------	0	83	0	2	0	7	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	1	0	------	0	12	0	0	0	0	0	0	------
Maryland:												
Baltimore	16	0	------	0	461	0	4	0	42	0	0	17
Cumberland	0	0	------	0	------	0	1	0	6	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	1	350	1	5	0	25	0	0	5
Virginia:												
Lynchburg	0	0	------	0	9	0	1	0	3	0	0	2
Richmond	0	0	24	0	21	2	0	0	13	0	0	------
Roanoke	0	0	------	0	8	0	0	0	5	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	1	0	0	------
Wheeling	0	0	------	0	------	0	1	0	0	0	0	10
North Carolina:												
Raleigh	0	0	------	0	37	0	2	0	0	0	0	3
Wilmington	0	0	------	0	43	0	0	0	0	0	0	------
Winston-Salem	0	0	------	0	24	0	0	0	2	0	0	22
South Carolina:												
Charleston	0	0	17	0	35	0	1	0	4	0	0	3
Georgia:												
Atlanta	0	0	------	0	5	0	0	0	4	0	0	------
Brunswick	0	0	------	0	------	0	0	0	0	0	0	------
Savannah	0	0	1	0	2	0	1	0	0	0	0	------
Florida:												
Tampa	2	1	------	0	55	1	1	0	1	0	0	3
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	0	43	2	6	0	6	0	0	2
Nashville	1	0	------	0	22	0	2	0	2	0	0	2
Alabama:												
Birmingham	0	0	1	0	15	0	3	0	3	0	2	------
Mobile	1	0	1	2	------	0	2	0	2	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	10	0	4	0	2	0	0	------
Louisiana:												
New Orleans	1	0	3	2	8	1	6	0	5	0	1	1
Shreveport	0	0	------	0	------	0	5	0	0	0	0	------
Texas:												
Dallas	2	0	------	0	15	0	2	0	4	0	0	------
Galveston	0	0	------	0	5	0	2	0	0	0	0	------
Houston	5	0	------	0	8	0	5	0	3	0	7	------
San Antonio	2	0	1	1	54	1	5	0	0	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	1	0	0	0	1	0	0	------
Great Falls	0	0	------	0	7	0	0	0	1	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	1	0	------	0	------	0	1	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	3	0	0	0	0	0	0	2
Colorado:												
Denver	4	0	2	1	390	0	8	1	12	0	0	11
Pueblo	0	0	------	0	5	0	1	0	0	0	0	7
Utah:												
Salt Lake City	0	0	------	0	126	0	0	0	7	0	0	3

City reports for week ended Mar. 30, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Spokane	1	0	1	0	137	1	2	0	1	0	0	7
Tacoma	1	0		0	22	0	0	0	1	0	0	13
California:												
Los Angeles	6	0	13	1	441	3	6	0	51	0	0	6
Sacramento	1	0		0	224	0	0	0	1	0	0	9
San Francisco	2	0		0		0	11	2	28	0	0	
Total	92	4	79	17	13,265	51	360	4	1,400	0	15	524
Corresponding week, 1945	75		34	24	978		381		1,802	0	3	523
Average, 1941–45	63		157	[1] 37	[2] 7,020		[1] 458		1,723	1	13	796

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Anthrax.—Cases: Philadelphia 1.
Dysentery, amebic.—Cases: Boston 1; Detroit 1; Minneapolis 1; Charleston, S. C., 2; Nashville 1; Los Angeles 3; San Francisco 1.
Dysentery, bacillary.—Cases: New York 1; Baltimore 1; Los Angeles 3.
Dysentery, unspecified.—Cases: San Antonio 6.
Typhus fever, endemic.—Cases: Atlanta 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 86 cities in the preceding table (estimated population, 1943, 33,845,200)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	10.9	0.0	5.5	5.5	1,576	5.5	90.1	0.0	251	0.0	2.7	191
Middle Atlantic	10.2	0.5	3.2	1.9	2,357	6.9	52.3	0.5	317	0.0	1.4	68
East North Central	7.9	0.6	3.0	1.2	2,824	10.9	48.6	0.0	185	0.0	0.0	100
West North Central	12.1	2.0	2.0	2.0	710	8.0	92.5	0.0	165	0.0	2.0	28
South Atlantic	31.1	1.6	68.6	1.6	1,736	6.5	27.8	0.0	173	0.0	0.0	106
East South Central	11.8	0.0	11.8	11.8	472	11.8	76.7	0.0	77	0.0	11.8	24
West South Central	28.7	0.0	11.5	8.6	287	5.7	83.2	0.0	40	0.0	23.0	4
Mountain	39.7	0.0	15.9	7.9	4,225	0.0	79.4	7.9	167	0.0	0.0	183
Pacific	20.0	0.0	25.5	1.8	1,501	7.3	34.6	3.6	149	0.0	0.0	63
Total	14.2	0.6	12.2	2.6	2,049	7.9	55.6	0.6	216	0.0	2.3	81

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

Up to April 9, a total of 11 cases of smallpox, with no deaths, had been reported in San Francisco, including 4 cases from two Navy transports during the week ended April 6 and the original case, which occurred in a member of the armed forces flown from Japan. In addition to the original case, 6 other cases had been reported in San Francisco, onset of the latest local case to April 10 being on March 27.

A total of 40 cases with 7 deaths, had been reported in Washington State up to April 11, 37 cases and 7 deaths in the Seattle-King County area, 1 case in Longview, Cowlitz County, 1 case in Friday Harbor, San Juan County, and 1 case in Waterville, Douglas County, the latter case not associated with the Seattle-King County cases. Date of latest reported cases in Seattle-King County area, April 11.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 9, 1946.—During the week ended March 9, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		2		60	216	15	22	30	120	465
Diphtheria		5	1	19	14	1			3	43
Dysentery:										
Amebic					1					1
Bacillary					1					1
German measles		2		51	27		2	17	5	104
Influenza		33			45	1			54	133
Measles		369	16	567	1,798	7	9	24	44	2,834
Meningitis, meningococcus			1	1	4	1		2	1	10
Mumps			2	74	267	61	4	78	103	589
Scarlet fever		9	2	87	78	11	4	19	18	228
Tuberculosis (all forms)		5	13	90	66	10	16	12	71	283
Typhoid and paratyphoid fever				10	6					16
Undulant fever				1						1
Venereal diseases:										
Gonorrhea	1	19	52	151	154	56	51	60	99	643
Syphilis	1	13	6	140	82	12	9	9	49	321
Whooping cough		2		111	46			2	4	165

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; P, present]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-December 1945	January-February 1946	March 1946—week ended—				
				2	9	16	23	30
ASIA								
Burma	C	7,769	22					
Rangoon	C	[1] 65	1					
Ceylon: Trincomalee District	C	19						
China:[2]								
Canton	C							[3] 11
Hupeh Province	C	129						
Kwangsi Province	C	1,266						

See footnotes at end of table.

CHOLERA—Continued

[C indicates cases; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended—				
				2	9	16	23	30
ASIA—continued								
China—Continued								
Kwantung Province	C	178						
Kweichow Province	C	906						
Shensi Province	C	49						
Sikong Province	C	113						
Szechwan Province	C	14,748						
Chungking	C	8,000						
Yunnan Province	C	137						
India	C	268,884	3,939					
Bombay	C	101						
Calcutta	C	5,298	269	57	60	74		
Cawnpore	C	202						
Chittagong	C	19	2					
Delhi	C	318						
Madras	C	53	2					
Vizagapatam	C	31						
Indochina: Cochinchina	C	P						
Philippine Islands: Negros Province	C	[4] 1						
Thailand (Siam)	C	5,945	[5] 293					
Bangkok	C	1,351	[5] 24					

[1] For the period May 1 to Dec. 31, 1945.
[2] Cholera was also reported present during August in the following Provinces of China: Chekiang, Honan, Hunan and Kansu.
[3] For the period Mar. 1–26, 1946.
[4] For the period Nov. 25 to Dec. 15, 1945.
[5] For the week ended Jan. 26, 1946.

PLAGUE

[C indicates cases; D, deaths; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended—				
				2	9	16	23	30
AFRICA								
Algeria	C	[1] 14		1	1			
Basutoland	C	4						
Bechuanaland	C	19	P					
Belgian Congo	C	[2] 28	2					
British East Africa:								
Kenya	C	[3] 93	7					
Uganda	C	6	7					
Egypt	C	217	11	4	4	3		
Alexandria	C		6	4	3			
Ismailiya	C	90			1	3		
Port Said	C	84	1					
Suez	C	16	4					
French West Africa	C	5						
Dakar	C	1						
Madagascar	C	184	80					
Morocco (French)	C	811						
Senegal	C	54						
Tunisia	C	3						
Union of South Africa	C	18						
ASIA								
Burma	C	697	20					
Rangoon	C	[4] 21	2					
China:								
Chekiang Province	C	50						
Foochow	C	30						
Fukien Province	C							[5] 6
Kiangsi Province	C	2						
Kirin Province	C	75						
Kwangtung Province	C	17						
Yunnan Province [6]	C	38						

See footnotes at end of table.

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place	January-December 1945	January-February 1946	March 1946—week ended— 2	9	16	23	30
ASIA—continued							
India C	50,539	5,768					
Iraq C	34						
Manchuria: Liaopeh Province D		[7] 5					
Palestine C	46	12		1			
Plague-infected rats	42						
Thailand (Siam) C	143	1					
EUROPE							
France: Corsica—Ajaccio C	8						
Great Britain: Malta C	[8] 75	1	1				
Italy C	28						
Portugal: Azores C	55	[9] 8					
Spain: Canary Islands C	1						
NORTH AMERICA							
Canada: Alberta Province: [10]							
Plague-infected squirrels	2						
SOUTH AMERICA							
Argentina:							
Buenos Aires Province—Plague-infected rats	2						
Santiago del Estero Province C	2						
Tucuman Province C	1						
Bolivia:							
Santa Cruz Department C	[11] 79	12					
Tarija Department: Plague-infected rats		P					
Brazil:							
Alagoas State C	1						
Ceara State C	7						
Pernambuco State C	90						
Ecuador:							
Canar Province C	10						
Chimborazo Province C	6						
Loja Province C	29						
Peru:							
Ancash Department C	7						
Ica Department C	[12] 5						
Lambayeque Department C	13	1					
Libertad Department C	11						
Lima Department C	16	15					
Otuzco Department C	3						
Piura Department C	6						
Tumbes Province C	32						
OCEANIA							
Hawaii Territory D	[13] 1						
Plague-infected rats [14]	17	3					
New Caledonia: Loyalty Islands—Mare Island C	[7] 60						

1 Includes 4 cases of pneumonic plague.
2 Includes 7 suspected cases.
3 Includes 5 suspected cases.
4 For the period May 1–Dec. 31, 1945.
5 For the period Mar. 1–26, 1946.
6 Information dated July 5, 1945, stated that from April 1944 to May 1945, 85 deaths from plague had occurred in the mountainous region south of Kunming, China.
7 Pneumonic plague.
8 Includes 4 suspected cases.
9 Includes 2 pneumonic cases.
10 During the month of June 1945, plague infection in fleas was reported in Alberta Province. For the week ended July 28, 1945, plague infection was also reported in 6 pools of fleas in Alberta Province. For the week ended Aug. 11, 1945, 2 pools of plague-infected fleas were reported in Alberta Province, Canada.
11 Includes 6 suspected cases.
12 Includes 1 suspected case.
13 Previously reported as a case, death occurring on June 2, 1945.
14 Plague infection was also proved positive in a pool of 5 mice on Jan. 4, in a pool of fleas on Feb. 14, in a pool of 40 fleas on Mar. 14, and in a pool of 47 rats on Dec. 15, 1945.

SMALLPOX

[C indicates cases; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended—				
				2	9	16	23	30
AFRICA								
Algeria	C	209						
Angola	C	253						
Basutoland	C	576	6					
Belgian Congo	C	[1] 6,938	[1] 345	[1] 48				
British East Africa:								
Kenya	C	815	208	12	13	15	5	
Nyasaland	C	170	44		8			
Tanganyika	C	10,862	783					
Uganda	C	1,279	101	1				
Cameroon (French)	C	837	27				1	
Dahomey	C	330	288				[2] 455	
Egypt	C	1,262	83	11	3			
French Equatorial Africa	C	2,664	84					
French Guinea	C	1,724	88				[2] 241	
French West Africa: Dakar District	C	8,078	14				[2] 8	
Gambia	C	82	1					
Gold Coast	C	914	501					
Ivory Coast	C	563	193				[2] 65	
Libya	C	25	30	1		6		
Mauritania	C	85						
Morocco (French)	C	3,198	914				[2] 244	
Mozambique	C	1						
Nigeria	C	5,137	417					
Niger Territory	C	638	169				[2] 46	
Rhodesia:								
Northern	C	6,005	141	4				
Southern	C	16				1		
Senegal	C	504	12				[2] 19	
Sierra Leone	C	106	161					
Somaliland, British	C	1						
Sudan (Anglo-Egyptian)	C	[3] 5	2	7	1		1	
Sudan (French)	C	3,004	1,087				[2] 351	
Togo (British)	C	54						
Togo (French)	C	528	27		1			
Tunisia	C	207	27					
Union of South Africa [4]	C	2,337	P	P	P	P		
ASIA								
Arabia	C	29						
Burma: Rangoon	C	[5] 81	74					
Ceylon	C	[6] 848	261	8	6			
China	C	1,530	163	25				
India	C	284,480	20,046					
Indochina (French)	C		21					
Iran	C	400	1					
Iraq	C	41	2					
Japan	C	1,719	495					
Palestine	C				1			
Syria and Lebanon	C	14			7			
Thailand (Siam)	C	34,970	[7] 872					
Trans-Jordan	C	2						
Turkey (see Turkey in Europe).								
EUROPE								
Belgium	C	1						
Czechoslovakia	C		24					
France	C	27	2	3				
Germany	C	3						
Gibraltar	C		[8] 1					
Great Britain:								
England	C	[9] 5	[9] 7	[9] 8		[8] 1		
Scotland	C	[10] 2						
Greece	C		1					
Italy	C	2,724	164		11			
Sicily	C	9						
Portugal	C	29	5	5	1	1		
Spain	C	31						
Canary Islands	C	1						
Turkey	C	297	7	3				
NORTH AMERICA								
Canada	C	6	2					
Guatemala	C	4	50					
Honduras	C	8						[11] 3
Mexico	C	1,426	93					
Nicaragua	C	[1] 141						

See footnotes at end of table.

SMALLPOX—Continued

[C indicates cases; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended— 2	9	16	23	30
SOUTH AMERICA								
Argentina	C	6	2					
Bolivia	C	1,793	109					
Brazil	C	[1] 941	10					
Colombia	C	1,234	10					
Ecuador	C	40	6					
Paraguay	C	1						
Peru	C	276	23					
Uruguay	C	106	9					
Venezuela	C	[1] 970	318					[1] 25

[1] Includes cases of alastrim.
[2] For the period Mar. 1-20, 1946.
[3] Includes 3 imported cases.
[4] For the week ended June 30, 1945, cases of virulent smallpox were reported in the Union of South Africa.
[5] For the period May 1 to Dec. 31, 1945.
[6] Includes some cases of chickenpox.
[7] For the week ended Jan. 26, 1946.
[8] Imported.
[9] Includes imported cases.
[10] Includes 1 imported case.
[11] For the month of March 1946.

TYPHUS FEVER *

[C indicates cases; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended— 2	9	16	23	30
AFRICA								
Algeria	C	1,024						
Basutoland	C	118	1	1				
Belgian Congo [1]	C	1,091	902	96				
British East Africa: Kenya	C	40	9					
Egypt	C	18,471	598	87				
Eritrea	C	81	90	26	22	33		
French West Africa: Dakar [1]	C	20						
Gold Coast	C	1						
Libya: Tripolitania	C	43	10	1		1	7	
Madagascar	C	1						
Morocco (French)	C	8,143	914				[2] 435	
Morocco (Spanish)	C	8	1					
Nigeria	C	93	1					
Rhodesia, Northern	C	31						
Sierra Leone [1]	C	11	2					
Tunisia	C	403	65					
Union of South Africa	C	1,016	P	P	P			
ASIA								
Arabia	C		1					
China	C	2,182	10					
India	C	23	58					
Iran	C	826	4				3	
Iraq [1]	C	273	17	1	4	10	3	
Japan	C	2,392	128					
Palestine [1]	C	191	4					
Syria and Lebanon	C	15	30	3	5	2		
Trans-Jordan	C	47	1	3	5	1	1	
Turkey (see Turkey in Europe).								
EUROPE								
Albania	C	262						
Austria	C	56	17	1		4		
Belgium	C	158						
Bulgaria	C	1,030	200	85	41			
Czechoslovakia	C	582	327					
Denmark	C	162						
France	C	512	3					

See footnotes at end of table.

TYPHUS FEVER *—Continued

[C indicates cases; P, present]

Place		January-December 1945	January-February 1946	March 1946—week ended— 2	9	16	23	30
EUROPE—continued								
Germany	C	8,025	730	10	124	82		
Gibraltar [1]	C	9						
Great Britain	C	[3] 26						
Malta and Gozo [1]	C	15						
Greece	C	697	56	12		12		6
Hungary [4]	C		189	54				
Italy	C	198	6					
Netherlands	C	67	15					
Norway	C	8						
Poland	C	17,146	1,200					
Portugal	C	53	1					
Rumania	C	10,177	[5] 568		412			
Spain	C	27						
Sweden	C	226						
Switzerland	C	6						
Turkey	C	2,795	403					
Yugoslavia	C	14,157						
NORTH AMERICA								
Canada [1]	C	1						
Costa Rica [1]	C	18	21					
Cuba [1]	C	13	3		1			
Guatemala	C	2,834	120					
Jamaica [1]	C	49	8	1	1			
Martinique [1]	C	1						
Mexico	C	,687	217					
Panama (Republic)	C	6	1					
Puerto Rico [1]	C	180						
Virgin Islands [1]	C	13						
SOUTH AMERICA								
Argentina	C	9						
Bolivia	C	770	36					
Brazil	C	8						
Chile [1]	C	655						
Colombia	C	533						
Curacao	C	4						
Ecuador	C	594	169					
Paraguay	C		1					
Peru	C	771	52					
Venezuela [1]	C	144	22					
OCEANIA								
Australia [1]	C	116	30					
Hawaii Territory [1]	C	104	12					

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Reports cases as murine type.
[2] For the period Mar. 1–20, 1946.
[3] Includes imported cases.
[4] For the period Jan. 1 to Sept. 1, 1945, between 8,000 and 10,000 cases of typhus fever were also reported in Hungary.
[5] For the week ended Jan. 26, 1946.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-December 1945	January-February 1946	March 1946—week ended— 2	9	16	23	30
AFRICA								
Gold Coast	C	[1] 13						
Nsawam	C	[2] 3						
Takoradi	C	1						
Tamale	C	[3] 1						
Winneba	C	[4] 4						
Ivory Coast:								
Gaoua	C	1						
Guiglo	C	1						
Sierra Leone: Moyamba	C	2						
Sudan (French): Bamako	C	[3] 1						
SOUTH AMERICA								
Bolivia:								
Beni Department	C	1						
La Paz Department	C	2						
Santa Cruz Department	D		[3] 39					
Brazil:								
Goiaz State	D	76						
Minas Geraes State	D	25						
Para State	D	1						
British Guiana: Kwakwani	C	1						
Colombia:								
Magdalena Department	D	3						
Putumayo Commissary	D	1						
Santander de Norte Department	D	19						
Peru:								
Cuzco Department	C	3						
Junin Department	C	[5] 6						
Loreto Department	C	1						
Venezuela:								
Bolivar State	C	1						
Merida State	C	3						
Tachira State [6]	D	20	[7] 2					
Trujillo State	C	1	3		1			
Zulia State	C	8	4					

[1] Includes 4 suspected cases.
[2] Includes 2 suspected cases.
[3] Suspected.
[4] Includes 1 suspected case.
[5] Includes 3 suspected cases.
[6] A telegraphic report dated Apr. 1, 1946, states that 1 case of yellow fever was reported in Abejales, Municipality of San Antonio de Caparo, Uribante District, and 1 case was reported in La Concordia area, Municipality of San Sebastian, San Cristobal District, both in Tachira State, Venezuela.
[7] Reported as cases.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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TUBERCULOSIS CONTROL ISSUE NO. 3

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Public Health Reports

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EDITORIAL[1]

TUBERCULOSIS RECORD SYSTEMS

Recent acceleration in tuberculosis control activities in State and local health departments has been largely motivated by mass radiography in case finding. The widespread application of small-film techniques has discovered more active, subclinical, and suspicious pulmonary tuberculosis than has ever been detected before in the history of public health. Even a casual survey of the majority of local programs reveals that quality and quantity of case finding have far surpassed the basic follow-up and case holding of newly discovered tuberculosis.

Simple and efficient tuberculosis record systems that are planned to meet local needs are fundamental to good follow-up procedures. They facilitate a maximum utilization of limited clinical, laboratory, and field nursing services. To correlate all phases of tuberculosis control, to bring about an equitable distribution of professional services, there exists an urgent need for extensive record systems based upon defined requirements. Even individual case management is hampered by the inadequacy of existing records.

With the rapid expansion of local, State, and Federal activities, local registers and record systems have assumed additional significance. In a local area with an established tuberculosis control program, a case register has repeatedly been recommended for case management, for current inventory of the case load, interval evaluation of the effectiveness of activities in relation to their cost, and for a realistic knowledge of the extent of the problem.

Now that State and local health departments are launching State, county, and city projects to find cases and to give medical supervision

*This is the third of a series of special issues of PUBLIC HEALTH REPORTS devoted exclusively to tuberculosis control, which will appear the first week of each month. The series began with the Mar. 1, 1946, issue.

[1] From the Office of the Chief, Tuberculosis Control Division.

to ambulant persons, tuberculosis record systems and coordinated local registers become essential, if the full benefits of any new program are to be experienced. Inefficient record systems will encumber and defeat the most promising of tuberculosis control programs. However, smoothly functioning record systems, even though they precede necessary services, may well be the essential administrative tool needed for the development and eventual success of the program.

Local registers are especially useful in individual case management. State tuberculosis record systems that contain summarized information from local sources are essential in program supervision, planning, and evaluation. Semiannual or annual compilation of uniform data from the State health departments makes possible a concise and current national summary of the extent and results of case finding, the ultimate disposition of cases discovered, and the trends in morbidity and mortality. In addition, such a summary presents an opportunity to base long-range planning on predictions derived from analyses of reliable data. Comparisons of State records can easily be made and, as areas of great need become apparent, additional funds and personnel can be concentrated in any given community before irreparable damage to public health is done.

The tuberculosis services of a health department cannot be described by statistics alone. However, a combination of meaningful statistical summary and professional description of nonquantitative tuberculosis activities can supply the best answers to the administrator who must justify his health program in terms of protection of the community, extent of the problem, effectiveness of all activities, and funds expended.

Well-planned and effective record systems can make the practice of public health, as applied to tuberculosis control, really a science and not just empirical guesswork. Many questions in the epidemiology of tuberculosis remain unsolved. They require solution before eradication of the disease can be realized in a measurable time. Better records, and time for their analysis, could reduce the number of past mistakes and enable us to determine if what we have proposed and carried out has accomplished the desired end.

THE MODALITIES OF BED REST [1]

By William M. Peck, M. D. [2]

Recent criticisms (*1*) have been made of bed rest as a therapeutic agent in many kindred medical fields. The consensus of these

[1] Presented before the meeting of the Illinois Trudeau Society, Rockford, Ill., Feb. 27, 1946.
[2] Wm. H. Maybury Sanatorium (Detroit Municipal Tuberculosis Sanatorium), Northville, Mich.

criticisms seems to be (*a*) that prolonged rest in bed is potentially harmful, and (*b*) that it is of too little therapeutic value to justify the risks which it entails. Most authors have circumspectly avoided applying their generalizations to tuberculosis, yet to those in phthisiology it is challenging to reevaluate our concepts of bed rest in the light of such current skepticism. We should ask ourselves the following questions: What are the dangers of bed rest as they apply to the tuberculous person and are they commensurate with the risk which patients must take from tuberculosis when treated without bed rest? or, more constructively, Is it possible to distinguish among these various factors of bed rest in such a way as to reduce the dangerous ones to a minimum while exploiting to the utmost those which seem beneficial? Has a clinical finesse, perhaps, a much more prominent place in conducting a bed-rest program than conceded to it in recent years?

Several factors have served to direct our attention away from such questions. For one thing, bed rest in tuberculosis has long been accepted as a therapeutic verity and as a result, we have ceased to pay it much attention. We have been trained to pay it lip service even while turning our backs on it. In a general way the bed-rest program has become a nursing problem while the physician's chief interest has become the collapse program. In most modern sanatoria collapse is applied extensively, so that the results of bed rest, good or bad, can seldom be distinguished clearly from those of the associated collapse. The increasing tendency to think of bed rest in terms of quantity or duration, rather than quality, has also served to diminish appreciation for its mode of application.

The present report is an attempt to present a concept of bed rest which has been evolved at Maybury Sanatorium, Northville, Mich., while following a group of very far advanced patients who had been rejected for the collapse program because of extent of disease and limited respiratory reserve. It was evolved as certain factors began to stand out prominently in deciding the eventual outcome. The fundamental considerations are not in themselves original and any uniqueness in the concept is due merely to emphasis and to technique of application.[3] A recent statement from this institution briefly described the concept (*2*).

In the past those patients rejected for collapse because of extent of the disease had been left at bed rest with medical supervision confined mostly to answering complaints or ordering codeine, sedatives, and eyewash. Since the prognosis was almost uniformly bad, the group was regarded as requiring a domiciliary rather than a therapeutic

[3] Dr. Roger Hanna at a meeting of the Michigan Trudeau Society some years ago stressed the need for close medical supervision of the bed-rest program and cited the importance of postural aspects.

program, and when an exceptional recovery occurred, it was considered almost as an anomaly.

Several years ago, we began to wonder if such a pessimistic attitude was really warranted and if very careful medical supervision might alter our attitude. As a result, we established a small service for such patients with added nursing facilities and close dietary supervision. Since the number of beds at any one time was limited, selection was shown to the extent of excluding recalcitrant patients and those with personality defects which would obviously make a high degree of cooperation impossible. These patients were then placed on a regimen of very strict bed rest with instructions never to sit up, never to raise the head from the pillow, and to lie as inertly as possible. Shortly, difficulties began to appear. Cough frequently increased with roentgenological evidence indicating poor drainage of secretions, and a few patients showed serious extension of disease. Many of them became nervous and tense and complained much more of fatigue than before going to bed. It seemed obvious that strict bed rest at times might be harmful—actually defeating the purpose for which it was given. The problem seemed to be how to maintain the advantages of strict bed rest and yet eliminate these difficulties.

The Problem of Adequate Drainage

Upon analyzing these cases further we realized that most patients at bed rest, when left to their own devices, spend much of the time in

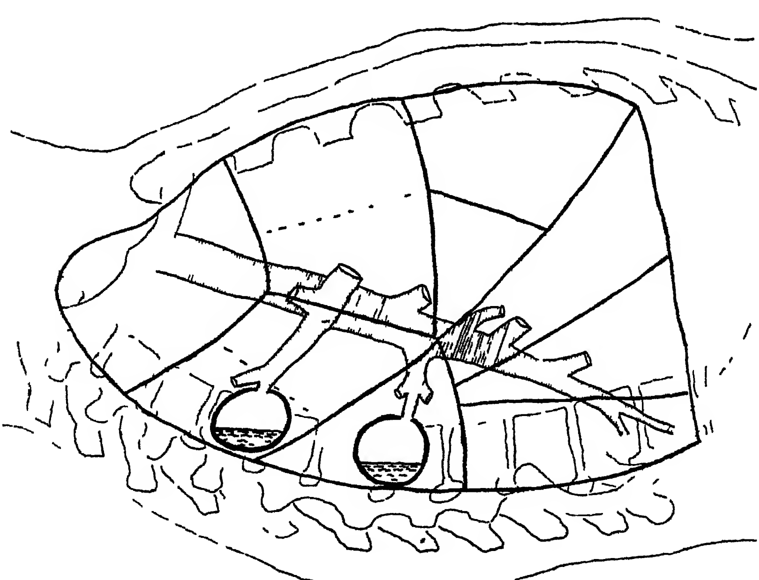

Diagram illustrating the problem in adequately draining cavitation of two commonly involved broncho-pulmonary segments when patient remains in the supine position.

a supine position. Unfortunately, as we all know, cavitation [illegible] with notable predilection in the posterior portion of the chest. Current studies at Maybury show that in the upper lobe, the postero-lateral segment is most commonly involved and in the lower lobe the dorsal segment is by all odds the most common site of cavitation. Obviously we had violated the most fundamental law underlying the treatment of all suppurative lesions; namely, that of obtaining adequate dependent drainage. In abscesses elsewhere in the body we place the greatest insistence on this principle. We observe it scrupulously in bronchiectasis. In empyema our first concern is to obtain adequate dependent drainage. Even in pulmonary abscess the success of the treatment is contingent upon adequate dependent drainage. Yet in tuberculous pulmonary abscess (or cavity) most of us ignore the question wholly and even encourage a regimen which deliberately places the cavity in the worst possible position for drainage. Under such conditions cavitary contents can be removed only by hard, forceful cough which will disseminate the sputum throughout the tracheobronchial tree. Little wonder that some patients on bed rest became more toxic and developed serious spreads of their disease. Unfortunately, most of us have been trained to visualize the chest as a two-dimensional roentgenogram and we rarely think of the third dimension, which is the one of greatest importance in the recumbent patient. Possibly 40 percent of such patients will have bronchiectasis and a number of them will have tracheobronchial disease. Frequently, in primary disease large lymph nodes block the draining bronchi. These facts emphasize the need for adequate drainage.

A brief trial was made to improve drainage by elevating the foot of the bed, but it was soon realized that the problem was not so much elimination of sputum from the trachea and larger bronchi as from the involved bronchopulmonary segments where disease had most severely interfered with the normal cleansing mechanism.

A system was next introduced which seemed to be very successful. Patients were simply instructed to lie in all four positions—prone, supine, and either lateral position—at intervals throughout the day. Usually they were told to change position about every half hour. In cases where changing position would induce cough, however, it was felt that too much time had been spent in the preceding position so that secretions had accumulated in the dependent part. Emphasis was placed on the patient's comfort, and he was encouraged always to seek a comfortable, relaxed position without deliberate clock watching. Such a regimen not only permitted drainage from diseased areas but prevented stasis of contaminated secretions in normal areas of the lung, and it enlisted the patient's cooperation by making him an active participant in the treatment.

In the patient with unilateral cavitation the plan was modified only to the extent of suggesting that he not deliberately sleep on the less involved side. The idea that one may be able to maintain contralateral asepsis by keeping the diseased side always in a dependent position is untenable when one considers the splattering effect of cough on iodized oil during the course of a bronchogram. Such graphic evidence shows that severe cough may cause gross and repeated contamination of the entire tracheobronchial tree. On the other hand, any regimen which encourages free drainage with little or no necessity for cough should minimize such contamination.

Several other therapeutic manipulations were frequently useful supplements in promoting free drainage. Evidence of bronchospasm often appeared, giving rise to wheezing, feeling of "tightness in the chest," attacks of dyspnea, difficulty in raising sputum, or paroxysmal cough. When suspected, aminophyllin or vaponephrin were used freely, often with very gratifying relief of symptoms. From this experience it was felt that bronchospasm is a common factor in unsatisfactory pulmonary cleansing, often difficult to apprehend but yielding dramatically to proper therapy.

Sputum, to be effectively raised, should be of a viscosity optimum for ciliary cleansing. Thick, tenacious sputum is raised only with the greatest effort. On the other hand, watery sputum is liable to cause alveolar flooding with dangerous extension of disease. It seemed advisable, therefore, to watch the character of the sputum closely and to rely on steam inhalations (rather than less easily controlled chemical methods) to thin tenacious sputum which appeared to interfere with bronchial cleansing.

A profound conviction has developed that proper manipulation of such mechanical factors can usually establish successful pulmonary cleansing with little or no necessity for cough. Codeine was seldom necessary and then only in small amounts at specified intervals. The necessity for using codeine was regarded rather as an admission of failure in controlling cough and pulmonary evacuation by strictly physiological methods. In the presence of tracheobronchial disease the methods were most difficult to apply but also probably most urgently needed.

The Problem of Muscular Relaxation

Presumably the most obvious aim in bed rest is to decrease respiratory requirements to the point where a high degree of pulmonary rest is actually achieved. Since many of the patients in this group became hyperpneic on slight exertion, the need for maximum reduction in pulmonary work appeared unusually pertinent. It seemed that this might be best achieved by deliberately teaching muscular

relaxation. A method somewhat similar to Jacobson's (3) was used in which the patient was taught to recognize muscular tenseness and to overcome it by concentration on the part. Whether the method was successful, or whether it was merely the constant, daily suggestion and encouragement does not matter. The fact remained that an amazing degree of relaxation usually could be mastered. As a patient became more and more relaxed his breathing decreased somewhat in rate and became perceptibly more shallow. He became rested and developed a feeling of well-being. The sore back and muscular aching, which invariably were present at the beginning of bed rest, disappeared and rest in bed actually became pleasurable. Obviously, under such conditions much muscular tone was lost but tone seemed to serve no useful purpose in the bedfast patient and was readily regained when needed.

The Problem of Mental Repose

At first, problems in emotional maladjustment appeared prominent and threatened often to undermine all other efforts to give satisfactory bed rest. Despair over finances and frustrated ambitions, terror of the diagnosis, worry over the health of family contacts or loyalty of marital mates had left many patients emotionally sick and given to morbid preoccupations. Enforced recumbency seemed to heighten emotional crises and to produce a train of undesirable sequelae, such as despondency, nervousness, tenseness, apprehension, insomnia, gastrointestinal complaints, or unnecessarily severe cough.

In these patients, already seriously ill with tuberculosis, such failure to achieve emotional calm is extremely serious, and often bears directly on the final issue of the case. As such, the prompt recognition and solution of the individual problem might be regarded almost as a medical emergency.

For instance, a 19-year-old girl was admitted some months ago with very extensive pulmonary tuberculosis. She was exhausted and gratefully accepted a regimen of strict bed rest. Six weeks later a phenomenal degree of improvement both clinical and roentgenological—had occurred. At this time her course suddenly altered and she became very despondent, spent much of her time crying, ate little, and slept poorly. Her cough became uncontrolled, and serial roentgenograms showed marked progression of her disease. Later it was learned that she had been brutally accused at that time of having infected a friend with tuberculosis and that the shame of a "murderess" had compelled her to conceal this basis for her despondency.

A 39-year-old male with extensive, far-advanced pulmonary tuberculosis became extremely apprehensive after admission. He remained

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very tense and excited at bed rest, complaining of fatigue and muscular aching. His cough was excessive, and extension of disease occurred in spite of his frightened efforts to cooperate. Several months later he stated that on the day of admission a maid, while unpacking his clothes, had casually remarked that tuberculosis was really incurable and that our only concern was in "keeping him off the street." With proper reassurance he was able to regain emotional stability and has since controlled his disease sufficiently to permit thoracoplasty to be successfully completed.

These and similar examples indicated the need for meticulous attention to proper adjustment. In an effort to avoid such incidents, it became the practice to spend much time with each patient, establishing suitable rapport and seeking out his problems. Psychological, social, and economic difficulties were discussed in detail and simplified when possible. A deliberate attempt was made to indoctrinate him with a philosophy which would allow him to accept his disease with equanimity even while maintaining enthusiasm for the future, and to regard the vexations of prolonged recumbency as a small price to pay for eventual recovery. An effort was made to counterbalance his fears by giving him a new basis for security—a steady confidence that recovery could in large part be determined by his own efforts in cooperating with the bed-rest schedule. With a view to subsequent rehabilitation, he was encouraged soon after admission to make plans for the future and even to start limited courses of study. Since the morale of the patient varied sensitively with the attitudes of those about him, it was necessary to keep ward attendants and the patient's relatives constantly reminded of their responsibility in this matter.

Attention to the emotional adjustment in the bedfast patient seemed to be one of the most rewarding therapeutic maneuvers, because it yielded results that wholly compensated for the time involved. It seemed clear that this should be regarded as a prime medical responsibility which, under no circumstances, should be left to the caprice of fellow patients or untrained personnel. Failure to obtain mental repose, in most instances, may be regarded as a serious reflection on the finesse of the medical care.

Discussion of Results

In this way, a concept of bed rest was evolved which was based on three fundamental modalities: Adequate drainage, muscular relaxation, and mental repose. We have learned to rely heavily on them as a yardstick in measuring the trustworthiness of bed rest as a therapeutic agent. When present, great confidence may be placed in the rest, but when absent, one may question the value of the regimen and anticipate various difficulties.

This concept takes the supervision of rest out of the nursing ... and makes it a distinct medical responsibility, demanding the utmost in flexibility and individualization in meeting the vicissitudes of prolonged illness.

Because this concept was developed while observing patients unsuitable for collapse, it must not be inferred that it in any way competes with, or is antagonistic to, a full collapse program. On the contrary, it is designed to provide an understructure upon which a modern collapse program can be most satisfactorily established, and is intended to bolster a weak point in therapy rather than to degrade a strong one. Nevertheless, it must not be inferred that we think all patients should be treated by strict bed rest. We do believe, however, that the three modalities should be borne in mind while planning a bed-rest regimen, whether strict or modified.

It is too early to draw final conclusions from the groups of cases observed on this regimen but certain trends seem to be sufficiently obvious to warrant a preliminary statement. At this point it must be regarded as an illustrative rather than a statistical study. To date 69 patients have been treated in this manner at various times. The group is not larger because handling such sick patients has been time-consuming. Many of them were severely emaciated with marked anorexia. Some required prolonged parenteral feeding with protein hydrolysates before sufficient food could be ingested by mouth. All required very careful supervision of high protein diets to correct the the hypoproteinemia which was almost invariably present. Transfusions were often used to correct anemia.

Most of the patients had extensive bilateral disease, usually with bilateral cavitation, and obviously could not have tolerated the amount of collapse necessary to control the disease. There were only a few exceptions in cases where contra-indication to collapse was severe bronchial disease, or marked exudative quality of the lesion. Ages of the patients ranged from 12 to 45 years, with the majority being in the third decade. There were 43 women and 26 men; 8 were Negro. Of the entire group of 69 patients, 19, or 28 percent, had cavity closure with sputum conversion, 14 more had sufficient healing to permit limited thoracoplasty (some of these have thoracoplasty completed, while others are waiting for the operation). Twenty-six have been under treatment too short a time for definite evaluation. Half of these, however, have shown satisfactory improvement and half have failed to improve or have become worse. So far 10 patients (15 percent) have died. For those who died, the mean duration of hospitalization was only 4 months. Altogether, 42, or 48 percent, have either successfully controlled their disease or have healed it to a point where thoracoplasty could be undertaken.

Case Histories

CASE 1

C. F.—This 17-year-old white boy gave a history of insidious onset in July 1942. At admission on October 30, 1942, he was in poor general condition. His fever went to 101, and his respiratory rate varied from 22 to 30 per minute. There was cyanosis of the nail beds. Cough was severe and productive of about 1 ounce of tenacious mucopurulent sputum. Paroxysmal cough at mealtime induced vomiting. Sputum was positive on direct smear. The total white blood cell count was 22,500 with 88 percent neutrophiles. Roentgenogram (fig. 1A) showed infiltration of the mixed type throughout both lung fields. On the right there was a 5-cm. cavity in the apex of the lower lobe and 2½-cm. cavity in the upper lobe at the level of the first rib. This patient was too ill and had bilateral disease too extensive to permit collapse of any kind. He was placed on a regimen of strict bed rest and was allowed to lie mostly on his back. Roentgenological examination on April 28, 1943 (fig. 1B), showed some clearing of infiltration but revealed that the cavity in the lower lobe had increased in size. Since tuberculosis of the lumbar spine was also discovered, he was placed on a Striker frame so that at intervals throughout the day he could be turned in both prone and supine positions. His condition improved dramatically; the cavity decreased in size, and was no longer visible on November 8, 1943. His sputum became negative on concentration on January 29, 1944. Patient has remained in hospital because of spine lesion but is now being prepared for discharge. Figure 1C represents current pulmonary status.

CASE 2

P. S.—This 12-year-old white girl gave a history of an insidious onset in August 1942. Diagnosis of a lesion on the right was made several months before admission. The patient was placed in bed at home on a regimen of very strict bed rest and was instructed to lie constantly on the right side. Cough increased and was associated with great difficulty in raising sputum. At admission on March 2, 1943, the patient was seriously ill with fever going to 102, and with a respiratory rate of 24 to 26. Sputum was positive for tubercle bacilli on direct smear. Roentgenological and physical examinations (fig. 2A) seemed to indicate that the right lung had become inundated with its own secretions. Bronchoscopic examination showed no evidence of an obstructive lesion. The patient was considered too ill for collapse therapy and was placed on a regimen of bed rest with particular attention given to drainage (see text). Her sputum converted and she improved dramatically. Film shown in figure 2B represents condition of lung at discharge, September 2,

PLATE I

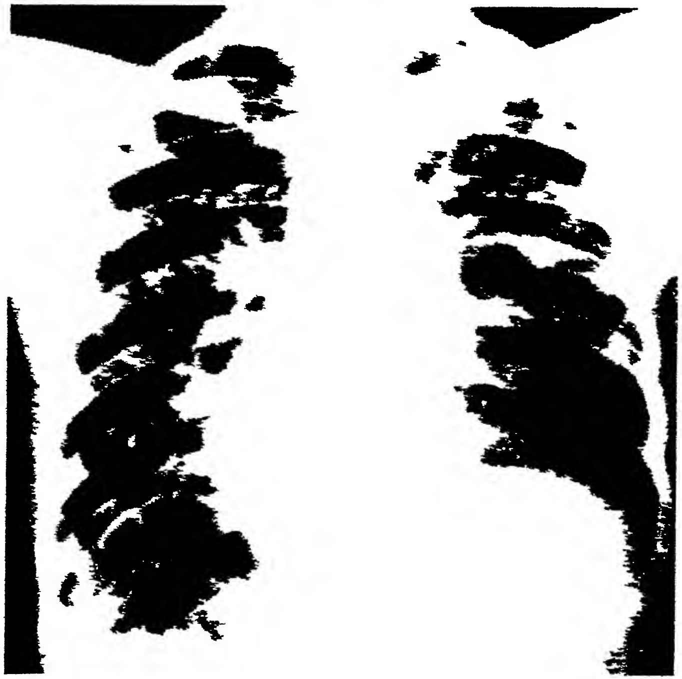

FIGURE 1A —Case 1

FIGURE 1B —Case 1

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PLATE II

FIGURE 2A.—Case 2.

FIGURE 1C.—Case 1.

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PLATE III

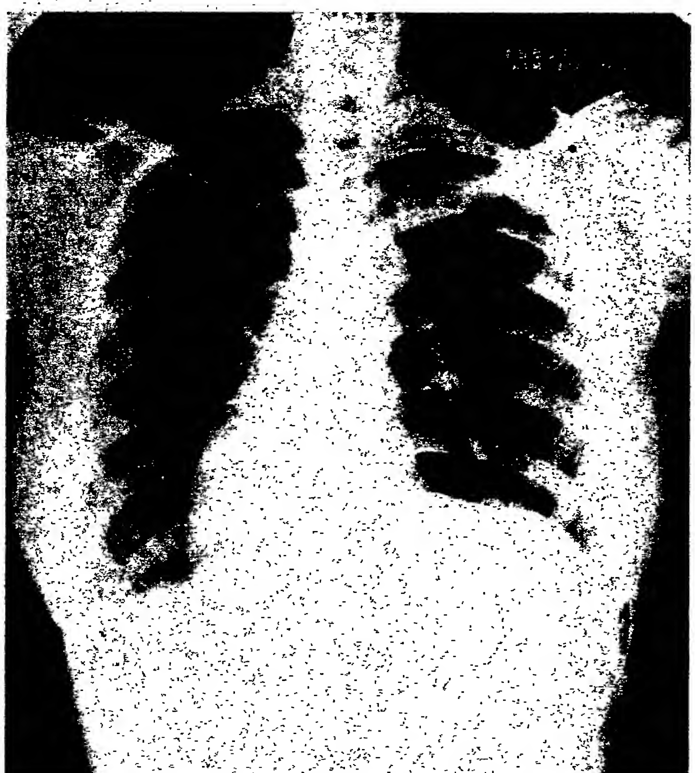

FIGURE 2B.—Case 2.

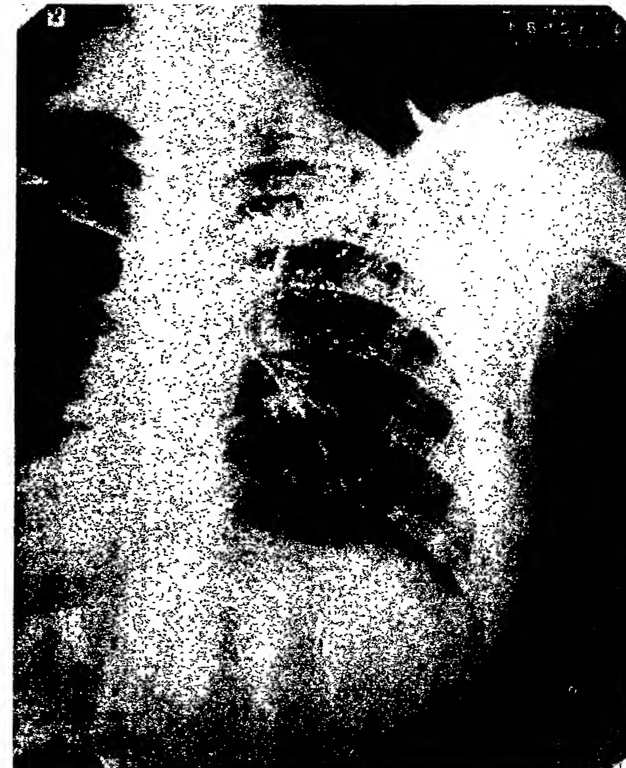

FIGURE 2C.—Case 2.

1944. Bronchogram at this time showed residual bronchiectasis in the right upper lobe. It is illustrated in figure 2C. It was felt that unintelligent bed rest had jeopardized the patient's life and may well have caused the residual bronchiectasis.

CASE 3

W. H.—This 20-year-old white male gave a history of an insidious onset January 1943. At admission on July 22, 1943 he was in poor general condition with dyspnea on mild exertion and with some cyanosis of the nail beds. He had a low-grade fever. Cough was moderately severe and sputum contained tubercle bacilli on direct smear. Barium meal studies showed tuberculous enteritis. Roentgenogram of chest (shown in fig. 3A) revealed infiltration involving the whole of both lung fields with extensive bilateral cavitation. The patient's limited respiratory reserve seemed to contraindicate all collapse procedures. He was placed on a regimen of careful bed rest. Cavity closure appeared complete, November 24, 1944, and sputum became negative to concentration during the same month. His general condition is now excellent, and he is ready for discharge. Possibly he has remained in the sanatorium longer than necessary. Figure 3B shows the marked degree of clearing and, indeed, of recovery that had taken place.

CASE 4

N. M.—This 23-year-old white woman gave a history of symptoms for 1 year. At admission on April 9, 1943, she was in poor general condition with fever going to 102. She complained of dyspnea at bed rest, although her respiratory rate varied from 20 to 24. She had severe abdominal cramps and barium-meal studies disclosed evidence of tuberculous enteritis. Her sputum contained tubercle bacilli on direct smear. Roentgenogram of chest (fig. 4A) revealed extensive infiltration of the exudative type throughout the right lung with a 1.5-cm. cavity at the second rib. On the left, dense areas of exudative infiltration were found in the upper half with a 6- or 7-cm. cavity in the apical region. Her limited respiratory reserve prevented all consideration of collapse procedure at that time. The patient was placed on a regimen of strict bed rest. By November 14, 1944, (fig. 4B) she had improved sufficiently for thoracoplasty. This has since been successfully completed and the patient has been discharged.

CASE 5

B. R.—This 23-year-old white woman experienced an insidious onset September 1942. At admission on January 26, 1943, she was in fairly poor general condition with moderately severe cough. She

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FIGURE 3A —Case 3

FIGURE 3B – Case 3

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PLATE V

FIGURE 4B.—Case 4.

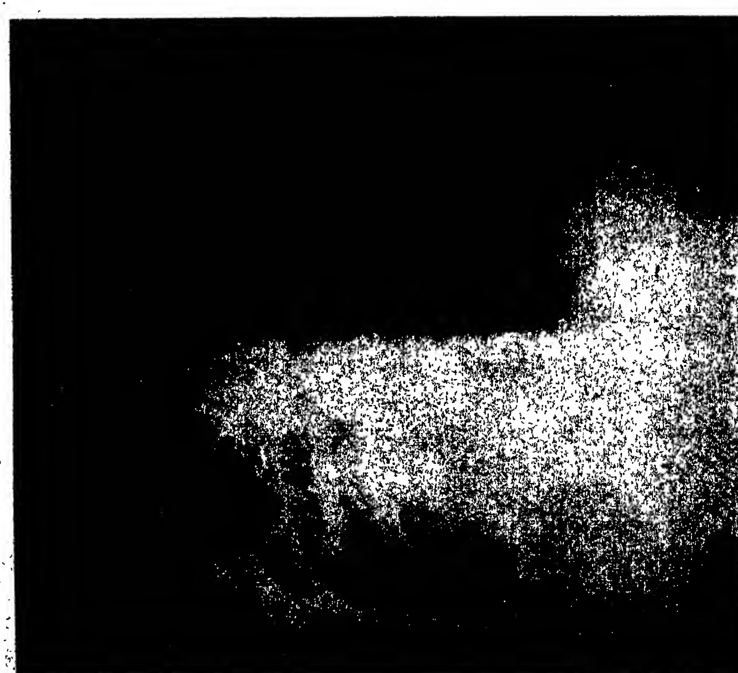

FIGURE 4A.—Case 4.

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FIGURE 5A —Case 5

FIGURE —C
Reversed f left

had a low-grade fever. Sputum was positive for tubercle bacilli on direct smear. Chest roentgenogram showed on the right scattered infiltration in the upper half of the lung with several areas of cavitation, the largest of which was 3 cm. On the left were scattered infiltrations in the upper half with a 7-cm. cavity in the infraclavicular region. This is illustrated in figure 5A. It seemed obvious that the patient could not have tolerated extreme bilateral collapse sufficient to control her lesion. The patient was placed on a regimen of careful rest. Cavity closure appeared complete on October 14, 1943, and was soon followed by sputum conversion. She transferred to another institution on November 28, 1944, and was discharged about 6 months later. Figure 5B shows final status after lesion had ceased to change.

An attempt has been made to obtain a control series from patients discharged in 1942 who were left at bed rest without close medical supervision. Sixty-nine consecutive cases in a similar age group, with comparable pulmonary lesions, were selected, not including those with frankly terminal disease. Obviously, such a control group selected in retrospect and involving the possibility of personal bias, is not altogether above criticism. In this control series, however, 2 patients had cavity closure and sputum conversion without collapse; 7 controlled their disease, so that thoracoplasty was feasible; 12 were discharged unimproved; and 48 died. The results in the present group of patients who were treated by careful supervision of bed rest are probably misleadingly good, since, for the most part, they represent the early results. Late results may be anticipated to be less gratifying. Nevertheless, they fully demonstrate that carefully supervised bed rest is potent therapy that gives results entirely commensurate with the time and energy involved. These data are presented in the following tabulation:

	Number	*Cavity closure and sputum conversion*	*Prepared for thoracoplasty*	*Improved*	*Unimproved*	*Dead*
Group with supervised rest	69	19	14	13	13	10
Control group [1]	69	2	7	0	12	48

Conclusions

1. A concept of bed rest has been described which is based on three fundamental modalities: (*a*) Adequate drainage; (*b*) muscular relaxation; and (*c*) mental repose.

2. A group of 69 patients with far-advanced tuberculosis unsuitable for the collapse program were treated by carefully supervised bed

[1] Control group consists of 69 consecutive cases unsuitable for the collapse program who were discharged in 1942. Those with frankly terminal disease were eliminated so that the two groups are comparable as to extent of pulmonary lesions.

rest, based on this concept. Nineteen had cavity closure and sputum conversion; 14 more had sufficient healing to permit thoracoplasty; 13 improved; 13 failed to improve; and 10 died. A control group of similar patients treated with bed rest without special consideration to this concept has been presented.

3. Bed rest is inherently valuable but unreliable when administered indifferently. It warrants constant, critical attention by the physician in order to insure good results.

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REVIEW OF TUBERCULOSIS CONTROL DEMONSTRATIONS AND THE PROGRAM OF GRANTS-IN-AID [1]

By Francis J. Weber, *Senior Surgeon, United States Public Health Service* [2]

For many years tuberculosis has been neglected to a certain extent because of widespread failure to recognize the problem and because of inadequate financial support. Public Law 410, enacted by Congress in June 1945, went far in improving these conditions. This law created the Tuberculosis Control Division in the United States Public Health Service and authorized the appropriation of funds for the support of the new Division and for money grants to the several States. The present paper constitutes a brief review of the activities of this Division since its formation, with particular reference to the work of field demonstrations and the new program of grants-in-aid.

Assistance to the States and Local Communities

When this Division began operation on July 1, 1944, many practical problems presented themselves, particularly those caused by personnel and material shortages owing to the prior claim of the war effort. Furthermore, the new law contained merely an authorization for funds and did not, in itself, provide an appropriation. Consequently, one of the first steps was to dispatch medical consultants to the field in the fall of 1944 to make surveys of the needs of individual States. In each State a realistic estimate of the sum needed to initiate or expand tuberculosis control programs was secured. The combined estimates of all the States then formed the basis of the first request for funds. Because of war restrictions, however, the sum finally voted by Con-

[1] From the Tuberculosis Control Division.
[2] Assistant Chief, Tuberculosis Control Division.

gress was considerably smaller than would have been forthcoming under ordinary circumstances. Moreover, there was a long delay in making available the appropriation for the first year with the result that funds did not reach the States until the last 6 weeks of the fiscal year.

In spite of such postponement of funds, the program began, and the State Aid, Radiology, and Field Studies Sections were organized. Space does not permit a detailed account of the functions and activities of all sections within the Division since such accounts must await the appearance of future issues. Suffice it to say that it was possible to inaugurate the programs of these three sections with money made available from Emergency Health and Sanitation funds even before a regular tuberculosis control appropriation was made available. Training programs were inaugurated; field demonstrations were started; new and improved record-keeping systems were developed; the services of special consultants were acquired; and basic research in field problems was initiated. Therefore, when the first grant to the States became available on May 15, 1945, it was possible to go forward with a national program which, in its basic organization at least, was complete. Since the program is now close to the end of its first full year of operation, it would seem appropriate to review some of the accomplishments of the field program during the period.

Assistance in tuberculosis control, from the United States Public Health Service to the State and local communities, may be considered under two main headings: (1) Direct services rendered by the Division through demonstrations and the loan of personnel and material; (2) Money grants to the States for expenditure by the States themselves in the development of more effective measures of prevention, control, and treatment of tuberculosis.

Demonstrations and Other Forms of Direct Assistance

The Division was able, even before grants-in-aid became available, to assist the States and local communities in many ways. During the first year, the Division conducted a training program with courses for 35 medical officers, plus 5 from foreign countries, while other courses of instruction were given for nurses and record analysts. In addition, the Radiology Section, in cooperation with the Saranac Lake Craft Guild and the Bureau of Vocational Rehabilitation, trained 53 photofluorographic operators. Many of the persons so trained (27 medical officers, 25 nurses and other nonprofessional personnel) were lent to State and local communities to assist in the development of control programs. Such assistance was particularly valuable because it came to the States in a time of critical personnel shortages.

Demonstrations designed to show the value of modern techniques in

case finding have been one of the principal activities of the Division. The chief tool of these demonstrations is the photofluorograph, and its effectiveness was evidenced by the rapid and exact examination of large population groups. It should be mentioned, however, that the case-finding program and demonstrations actually antedate the formation of the Division. In the beginning, when the Division was a section of the States Relations Division, case-finding demonstrations were carried on by eight small-film units. When additional funds were made available, however, it was possible during the first year of operation as a division to expand the number of these photofluorographic units to 20. Technical improvements developed by the Radiology Section increased the efficiency and economy of operation of these units. At the present time one small-film unit, with a team consisting of a medical officer, a technician, and a clerk, is able to finish an average of 500 examinations per 8-hour working day.

These units have been loaned to State and local communities upon request and full teams of operating personnel have been sent with them. In every instance these units have proved their usefulness as practical instruments for the discovery of cases of tuberculosis during the early remediable stages of infection. Since the beginning of these demonstration programs in 1942, over 1,000,000 persons have been examined. Of this total, 1.2 percent were found to have reinfection tuberculosis, and of those found to have active disease over two-thirds were in the minimal stage.

Table 1 gives a complete break-down by stage of infection of the results of these examinations conducted over a period of 3 years, including work in 29 different States. Such demonstrations leave no doubt that tuberculosis, by concerted community effort, can be discovered early enough so that, with adequate follow-up and treatment, the majority of infectious cases can be removed from the population and brought to early arrestment. These demonstration projects have enabled local communities to begin and to carry on effective case-finding and follow-up programs. Experience has shown that communities which have been the recipients of demonstration programs

TABLE 1

Number of films taken	Number of films analyzed	Total number of cases	Percent	Reinfection tuberculosis					
				Minimal number	Percent	Moderately advanced number	Percent	Far-advanced number	Percent
1,353,901	1,035,303	[1] 12,508	1.2	8,377	69.2	3,070	25.4	648	5.4

[1] Includes 413 cases for which no further analysis was received.

usually continue the work with their own personnel and equipment following completion of the demonstrations.

A majority of those examined by Public Health Service Demonstration Units have been industrial workers, mainly those engaged in war industries. While industrial workers, as a group, will continue to loom large in future mass radiography programs, a program is already under way, through the joint efforts of the American Hospital Association, the National Tuberculosis Association, and the United States Public Health Service, to have all general hospitals participate in the case-finding program by providing for the routine X-ray examination of all general hospital admissions and out-patients. Several large and small hospitals have already demonstrated the value of chest X-ray as a routine procedure, and one of these (*1*) with a program in operation during a period of 4 years, reports 9.3 percent of the total examined to have intrathoracic abnormalities with approximately 1.5 percent showing X-ray evidence of tuberculosis. The hospital group is quite a large one; the record shows that 16,000,000 persons entered general hospitals during 1944 (*2*). The work with this group, therefore, will be an important part of the national program.

Grants-in-Aid to the States

The pattern of grants-in-aid for tuberculosis control is similar to that of the older grant programs, such as general health and venereal disease control. With the single exception of specific purposes for which each separate fund is designated, the provisions of Secton 314 of Public Law 410 apply equally to all three grant programs. Moreover, like other Federal grants, they are intended to implement and extend particular services to insure adequate control of the problem as soon as possible.

With the addition of Federal grant-in-aid funds for tuberculosis control, it has become possible for the first time to correct the outstanding weakness of the earlier programs in the United States; that is, the lack of organized effort and adequate facilities in case finding and follow-up. Although the annual expenditure for maintainance and operation of tuberculosis sanatoria in the United States exceeds $100,000,000, the full usefulness of this great enterprise has not been realized, because the majority of sanatorium admissions represent patients in the more advanced stages of infection. As a consequence, there is abundant opportunity for spread of the disease, and the chances for cure of these patients are considerably diminished. The obvious solution lies in developing a program to get patients under treatment at an earlier, more easily controlled stage.

Therefore, the first grant funds secured from Congress have been employed largely for the establishment of health department services to insure discovery of an increased number of early cases. Such use

of funds has enabled the majority of States to organize large-scale mass chest X-ray service; to employ the use of small film; to provide for follow-up of discovered cases and discharged patients; and to conduct a program of education in cooperation with voluntary agencies.

During the latter part of the fiscal year 1945, $1,370,114 was made available by Congress for grants-in-aid to the States. This relatively modest sum allowed programs in the States to begin. Therefore, when on July 1, 1945, grants-in-aid totaling $5,200,000 became available to the States, full-time organization for tuberculosis control and planned programs of operation existed in nearly all States. To be sure, many of these were merely skeleton organizations but they represented, nevertheless, necessary first steps.

The progress made in the States since the funds became available can be traced by inspecting the recorded developments of the programs. For example, there were, in all of the States, only 21 full-time tuberculosis control officers at the time the Division began operation in July 1944. In other words, more than half of the States had no full-time director and, by inference, no full-time program. Within 15 months of that date, however, 40 of the States had secured full-time directors and had developed actively functioning programs. Developments in other directions have paralleled this increase. Grant-in-aid funds so far available have made possible the addition of approximately 1,000 professional personnel and an equal number in other categories, and approximately 300 X-ray units of varied types have been secured or placed on order.

This represents, of course, the mere beginning of a long-range program. It means that genuine advances have been made in the establishment of adequate case-finding and follow-up services and, to some extent, clinic service for ambulatory patients. However, there is still a shortage of sanatorium beds, especially in certain sections of the country, and this lack will become more apparent as the case-finding program approaches full development. Although case finding of the type contemplated by detecting cases in an earlier stage will modify to some extent the demands of treatment and make certain compromises possible, many more beds must be available if the eradication of tuberculosis is to be effected within a measurable period. It is hoped, therefore, that future programs will include provisions for additional treatment facilities.

Summary

An attempt has been made in this paper to present some of the more important aspects of the Federal assistance program for tuberculosis control administered by the United States Public Health Service. With funds available to the Tuberculosis Control Division, it has been

possible to complete an organization on the national level and to provide general Nation-wide planning. Consultation services, basic research, cooperative projects, and grants-in-aid make it possible for States to establish the machinery necessary for an effectively functioning Nation-wide control program. Grant-in-aid funds have already gone far toward the correction of such outstanding weakness as the lack of adequate case-finding and follow-up facilities. Case finding is well started among the various employee groups and steps have been taken to include all general hospital admissions and out-patients in this program. Since these groups, with their families, constitute a large segment of the Nation's population and since case finding of the type described has proved both successful and practicable, it is not too much to expect that through them, plus other important groups, a majority of the Nation's adult population can be reached within a reasonable period of time. Once case-finding and follow-up facilities have been developed to the fullest possible extent, additional treatment facilities can be provided. However, case finding and medical care and isolation are not enough to insure an effective tuberculosis control program. Rehabilitation and protection of the tuberculous family against economic distress are two other problems which take equal rank with the first two and they must be solved.

References

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(*2*) Hilleboe, H. E.: Tuberculosis is a general problem. The Modern Hospital, **65:** 75–78 (December 1945).

ISOLATION OF *MYCOBACTERIUM TUBERCULOSIS* FROM GASTRIC CONTENTS NEUTRALIZED AFTER VARYING PERIODS [1]

By Marian G. Sprick and John W. Towey [2]

Since the examination of gastric contents for *Mycobacterium tuberculosis* has become a recognized procedure in many sanatoria, the question has arisen as to whether there is any correlation between the length of time gastric specimens were allowed to stand before examination and the number of positive results for *M. tuberculosis* obtained. In some places laboratory facilities are available, so there is no delay in the examination of gastric contents. Other institutions, however, must mail the specimens and a delay of 24 to 48 hours occurs before the specimen can be neutralized, animals injected, and cultures made.

[1] Presented at a meeting of the Michigan Trudeau Society, Detroit, Sept. 27, 1945.

[2] From the Michigan Department of Health, Bureau of Laboratories, Powers Division. In cooperation with Pinecrest Sanatorium, Dr. J. W. Towey, Director, Powers, Mich.

Gastric lavages made by private physicians on out-patients al[illegible] ma be delayed before reaching the laboratory.

Over 50 years ago Straus and Wurtz (*1*) found that the gastric juice of dogs would not destroy tubercle bacilli, when exposed from 1 to 6 hours. However, if the organisms were in contact with the gastric juice 8 to 12 hours, only local lesions were produced on animal inoculation. After an exposure of 18 to 36 hours, no lesions were found.

Floyd and Page (*2*) found that when virulent tubercle bacilli were exposed to artificial gastric juice the effect on guinea pigs varied directly with the duration of exposure. After a 12-hour exposure to the artificial gastric juice, the lesions formed in guinea pigs decreased by 80 percent over those found in animals inoculated with tubercle bacilli that had been exposed only 3 hours.

Roper and Ordway (*3*), however, state that the viability of virulent human tubercle bacilli was not affected by free HCl up to $\frac{1}{10}$ normal strength and that the organisms were inhibited only slightly after continuous contact with acid for 40 hours. These workers apparently used acid solutions and not gastric juice.

Other workers, Piasecka-Zeyland (*4*) have found a thermolabile substance in human saliva which inhibits the growth of tubercle bacilli. Since gastric contents may be contaminated with saliva, this substance may have some effect on the results found.

Schwarting (*5*) found that holding untreated gastric specimens at either icebox or incubator temperatures for 24 hours was apt to convert a positive gastric lavage into a false negative one. In her study no tests were carried out at room temperature.

Methods

In this study the following procedure was used. The gastric specimen was brought to the laboratory immediately following aspiration. The volume was noted and the specimen was divided at once into three equal parts. One portion was treated immediately with Hank's (*6*) solution (4 percent sodium hydroxide and 0.2 percent alum). The other two portions were allowed to stand 24 and 48 hours, respectively, at room temperature and then were treated.

After an equal volume of Hank's solution was added to the gastric specimen, it was shaken thoroughly and digested for 30 minutes at 37° in the incubator. From 0.1 to 0.2 ml. of a 0.02-percent solution of Brom thymol blue was added as an indicator, and the mixture was neutralized with 2.5 N HCl. The specimen was transferred to 50-ml. centrifuge tubes and centrifuged at 2,000 r. p. m. for 10 to 15 minutes. The supernatant fluid was decanted and a stained slide preparation of the sediment was made and examined for acid-fast bacilli. One

milliliter of the sediment was inoculated into the inguinal region of a 250–300 gm. guinea pig and 2 ml. was cultured on Lowenstein's and Petragnani's medium. Two slants of each medium were used.

Results

A summary of the results of the repeated examinations on 33 patients from Pinecrest Sanatorium is shown in table 1.

TABLE 1.—*Results with 33 gastric specimens neutralized after varying periods*

Treatment with Hank's solution	Positive pig and/or culture	
	Number	Percent
Immediate	24	73
24-hour	15	45
48 hour	7	21

It will be observed that when the specimens were neutralized immediately, over three times as many positive results were obtained as were found when the specimens were allowed to stand for 48 hours at room temperature before neutralization. Nearly twice as many positives were found on specimens neutralized immediately as on those treated after standing 24 hours. Nine of the thirty-three specimens were negative throughout the series.

In table 2 the results with 25 gastric lavages by stained slide preparation and by guinea pig inoculation or culture are shown.

TABLE 2—*Results with 25 gastric specimens by stained slide preparation and pig and/or culture*

Treatment with Hank's solution	Gastric specimens		Gastric specimens	
	Stained slide preparation negative	Positive by pig and/or culture	Stained slide preparation positive	Positive by pig and/or culture
Immediate	18	17	7	7
24-hour	18	8	7	7
48-hour	18	3	7	4

There were 18 specimens that were negative for acid-fast organisms on the slide preparation. Seventeen of these specimens were positive for *M. tuberculosis* by culture or guinea pig inoculation after immediate treatment of the specimen, only 8 were positive after 24 hours and only 3 after 48 hours. One specimen was positive after 24 hours but negative after immediate and 48-hour treatment. Apparently, there are some gastric contents in which the inhibitory action of the gastric secretion is weak, as occasional specimens with negative slide preparations are positive by culture or pig after standing 48 hours at room temperature.

It is of interest to note that four specimens in which acid-fast or-

ganisms were found on slide preparation gave positive results in [illegible] pig and culture after standing 48 hours. However, the other three specimens with positive smears gave positive results with the immediate and 24-hour portions, but not with the 48-hour specimen This indicated that even though there are relatively many organisms present, some inhibitory effect may occur if specimens are held 48 hours at room temperature.

Comment

Although only a small number of specimens were examined, the results indicate that if gastric specimens are allowed to stand 24 or 48 hours before examination, fewer positive results will be found. In some sanatoria 2- to 5-day pooled gastric contents are examined. If the specimens are allowed to stand without being treated until the series of pooled gastrics is complete, one may question the value of the examination. If pooled specimens are desired, it would seem wise to treat each specimen immediately and then pool them rather than to save the gastric contents for several days before treating

Whether the effect of the gastric juice on the capacity of the tubercle bacilli to grow is due to a substance found in the saliva, to the acidity of the gastric juice, or possibly to some specific enzyme action has not been determined. Further work is indicated on this problem, as the time interval between treatment and the arrival of specimens in the laboratory assumes importance when gastric specimens are mailed to the laboratory. If the problem is the acidity of the gastric juice, some simple method of neutralizing the specimen before mailing may be worked out.

Summary

1. Thirty-three gastric specimens were studied as to the effect of neutralization immediately, after 24 hours, and after 48 hours.

2. Three times as many positive results were found when specimens were neutralized immediately as at 48 hours and nearly two times as many as after a 24-hour interval.

References

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(3) Roper, W. H., and Ordway, W. H. Gastric lavage in adults with pulmonary tuberculosis. Am. Rev. Tuberc., 43: 543 (1941).
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(5) Schwarting, V. M.: Inhibitive effect of gastric lavage on tubercle bacilli. Am. J. Clin. Path., 15: 234 (1945).
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Excerpts from

HOW MUCH CONTROL OF TUBERCULOSIS [1]

For the eventual eradication of tuberculosis it is not necessary that transmission be immediately and completely prevented. It is necessary only that the rate of transmission be held permanently below the level at which a given number of infection-spreading (i. e., open) cases succeed in establishing an equivalent number to carry on the succession. If, in successive periods of time, the number of infectious hosts is continuously reduced, the end result of this diminishing ratio, if continued long enough, must be extermination of the tubercle bacillus.

Bearing in mind this principle, it is a fair inference that in this country as a whole we have already reached the stage at which the biological balance is against the survival of the tubercle bacillus, for year by year the mortality from tuberculosis is decreasing. It is true that we do not have equally direct statistical evidence of a proportionate decrease in the prevalence of infective cases, taking into account not only the number of cases but duration of the open stage; but there appears to be no good reason to doubt that the prevalence of open cases is diminishing at something like the same rate as mortality from phthisis. This means that under present conditions of human resistance and environment the tubercle bacillus is losing ground, and that the eventual eradication of tuberculosis requires only that the present balance against it be maintained.

As to maintenance of this balance—favorable to us, unfavorable to the tubercle bacillus—there are, of course, elements of uncertainty, among them uncertainty as to the stability of our civilization. But if it be assumed that environmental control affecting the spread of tubercle bacilli from existing foci can be maintained at its present level (and we may justly expect to improve it), we know of only two forces which singly or together, would check or reverse the downward trend of tuberculosis. These are: (1) a decrease in human resistance to the disease, or (2) some fundamental change in the adaptation of the tubercle bacillus to its host, tending to favor survival of the parasite.

With respect to the latter possibility, we can do no better than base future expectations on past experience. Upon this basis, if we were discussing diphtheria, scarlet fever, or influenza, their past history would lead us to expect future changes, more or less sudden, in the disease-producing properties of their causative organisms. But present knowledge of tuberculosis is consistent with the view that the specific

[1] Frost, Wade Hampton· How Much Control of Tuberculosis. New York, The Commonwealth Fund, 1941.

properties of the tubercle bacillus have not changed appreciably in modern times; and in the absence of compelling evidence for such variation in the past, we are under no necessity of anticipating it in the future. Therefore, while we have no means of excluding this possibility, I do not know of any reason why we should expect it.

A question of more immediate concern is whether, with progressively diminished exposure to tuberculous infection, we must expect such decrease in human resistance to this infection as would check or reverse the present downward trend.

It is probable that one of the most important factors in the decline of tuberculosis has been progressively increasing human resistance, due to the influence of selective mortality and to environmental improvements such as better nutrition and relief from physical stress, tending to raise what may be called nonspecific resistance. It is, however, a reasonable expectation that the increase in average resistance due to these causes will be maintained, for, while complete elimination of the mortality from tuberculosis would check this process of raising genetic resistance, there is no apparent reason why it should result in reversion to a state of higher average susceptibility than exists today. Also, any gains due to better nutrition and to other elements of personal hygiene should be permanent if civilization continues at its present level or a higher one.

The kind of resistance which is of a less permanent order and which seems more likely to be lost, is individual specific immunization by so-called latent infection. At present a majority of the population in many areas acquire their first infection with the tubercle bacillus between late infancy and adolescence, precisely at the age when the immediate reaction to infection is most favorable. However, further reduction in the prevalence of tubercle bacilli in the environment must necessarily postpone first infections to a later average age; and, as it is believed by some authorities that primary infection is more dangerous in adults than in children, it is feared that such postponement of infection will in the end prove disadvantageous.

The question which is thus raised cannot at present be answered with assurance. We do not yet know enough about the nature and durability of any immunity which may be conferred by infection acquired in childhood. It is, however, significant that in those areas where childhood infection is most common, we find the highest mortality in adult life; and that in areas such as Cattaraugus County, N. Y., where a majority of adolescents are demonstrably tuberculin negative, the mortality in adult life is low. Also, occupational statistics show that in adult life the mortality from tuberculosis is lowest in the professional group who, as a class, have been least exposed to infection

in childhood. Therefore, while this whole question obviously needs much more study, there is at present no compelling evidence that the downward course of tuberculosis must be checked by eventual loss of mass immunity.

We need not assume, then, that tuberculosis is permanently and ineradicably engrafted upon our civilization. On the contrary, the evidence indicates that in this country the balance is already against the survival of the tubercle bacillus; and we may reasonably expect that the disease will eventually be eradicated. There can be no certainty of this result, but it is an expectation sufficiently well grounded to justify shaping our tuberculosis control program toward this definite end.

A FORECAST [1]

"Much has been accomplished but much remains to be done. Sixty thousand lives a year even now are taken by the tubercle bacillus. The goal of eradication can now be visualized in the distance. In the four decades since 1900, when the death rate was 202 per hundred thousand, the reduction in mortality from tuberculosis in the United States was 20 per cent in the first, 22 per cent in the second, 33 percent in the third, and 34 per cent in the fourth. We may assume, therefore, that this average decline of the last two decades can be maintained. Since the tuberculosis death rate was 45 in 1940, we may assume that it would be 32 in 1950; 21 in 1960; 14 in 1970; forty years from now in 1980 a rate of 10 may be anticipated. The bells that ring in the year 2000 may sound the death knell of the tubercle bacillus.

"The ultimate surrender of the tubercle bacillus, therefore, is at least two generations away unless new developments in treatment come to our aid. Let us hope that this surrender may be brought about more quickly by discoveries made in the fields of chemotherapy and nutrition. Research in both of these fields has yielded rich returns in recent years. But without waiting for new discoveries, let us make full use of the knowledge we have. This would mean intensifying case finding activities and concentrating them on the groups having the highest incidence of tuberculosis and treating the cases when found. To do this, more hospital beds are needed in many States and we should wage an active campaign to obtain them."

[1] Chadwick, Henry D., and Pope, Alton S. The Modern Attack on Tuberculosis. New York, The Commonwealth Fund. 1942. p. 85.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 13, 1946

Summary

Of 12 cases of smallpox reported for the week for the country as a whole, 8 occurred in Washington. For the year to date, 149 cases have been reported, as compared with 160 for the corresponding period last year and a 5-year (1941–45) median of 343. (See p. 662.)

A total of 40,746 cases of measles was reported for the week (exceeded only once in a corresponding week of the past 10 years—in 1941), as compared with 38,233 last week and a 5-year median of 27,161. An aggregate of 23,045 cases (about 57 percent of the total, as compared with 53 percent in the same area last week) was reported in the Middle Atlantic and East North Central areas. The total to date is 301,196, as compared with 40,379 and 437,994, respectively, in the corresponding periods of 1945 and 1941, the years of lowest and highest incidence for the corresponding periods of the past 5 years. The 5-year median is 262,946.

The total of 316 cases of diphtheria reported, as compared with 314 last week and a 5-year median of 243, is more than reported for a corresponding week since 1938. Pennsylvania reported the largest increase—from 19 to 29 cases. Only 3 other States reported more than 15 cases each—New York (36), Ohio (24), and Texas (34). The total for the year to date, 5,568 cases, is more than reported for the corresponding period of any other year since 1939.

Of the total of 29 cases of poliomyelitis, as compared with 28 last week and a 5-year median of 19, Texas reported 6, New York 4, and California 3. The total to date since the week ended March 16, the lowest weekly incidence so far this year, is 109, as compared with 124 for the corresponding period last year.

A total of 131 cases of meningococcus meningitis was reported, as compared with 158 last week and a 5-year median of 194. The largest numbers were reported in New York (14), Pennsylvania (13), and New Jersey and Illinois (10 each).

Deaths recorded for the week in 93 large cities of the United States totaled 9,105, as compared with 9,037 last week, and 9,154 and 9,572 for the corresponding weeks of 1945 and 1944, respectively, and a 3-year (1943–45) average of 9,528. The total to date is 150,718, as compared with 144,518 for the corresponding period last year.

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Telegraphic morbidity reports from State health officers for the week ended Apr. 13, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945	
NEW ENGLAND												
Maine	4	0	0	------	------	2	91	1	56	0	0	5
New Hampshire	0	0	0	1	------	------	125	1	27	1	0	0
Vermont	0	1	0	------	------	------	11	8	100	0	0	0
Massachusetts	3	0	4	------	------	------	1,816	203	1,013	2	8	5
Rhode Island	0	0	0	1	43	1	12	7	14	0	1	1
Connecticut	1	2	0	------	7	3	247	123	430	3	0	2
MIDDLE ATLANTIC												
New York	36	14	19	[1] 1	[1] 1	[1] 14	5,894	77	2,317	14	17	17
New Jersey	6	6	4	1	6	7	3,976	49	1,831	10	3	4
Pennsylvania	29	10	12	2	3	2	3,409	238	1,264	13	13	13
EAST NORTH CENTRAL												
Ohio	24	18	6	5	11	14	916	36	1,183	3	9	9
Indiana	12	2	3	5	1	7	768	14	224	5	4	4
Illinois	13	3	17	4	2	30	1,352	126	1,281	10	17	13
Michigan [2]	9	18	8	------	------	3	2,508	135	812	4	5	5
Wisconsin	2	0	1	36	10	37	4,222	52	1,622	4	2	2
WEST NORTH CENTRAL												
Minnesota	7	1	1	------	------	1	53	14	153	3	7	2
Iowa	5	4	4	------	------	------	148	39	301	2	6	2
Missouri	4	5	3	3	1	2	73	21	392	1	5	6
North Dakota	2	0	1	------	------	6	8	5	55	0	0	0
South Dakota	1	4	2	------	------	------	38	36	36	0	2	0
Nebraska	0	2	1	3	1	1	579	26	166	0	2	0
Kansas	3	2	2	5	------	4	693	54	623	1	3	3
SOUTH ATLANTIC												
Delaware	0	1	0	------	------	------	29	3	13	1	0	1
Maryland [2]	8	6	4	1	3	9	567	62	215	2	10	10
District of Columbia	0	0	0	1	2	1	212	4	83	0	1	2
Virginia	4	4	4	114	123	274	771	55	488	5	8	8
West Virginia	8	3	3	2	12	9	123	73	159	1	2	2
North Carolina	9	2	6	------	------	3	623	31	1130	2	8	8
South Carolina	5	7	4	292	195	408	427	28	251	0	2	1
Georgia	0	1	3	5	8	48	216	16	299	3	4	4
Florida	4	3	3	2	------	16	139	9	297	3	0	0
EAST SOUTH CENTRAL												
Kentucky	6	3	4	45	1	4	430	20	126	3	7	7
Tennessee	5	1	3	27	26	49	286	11	293	1	2	2
Alabama	7	8	8	11	38	108	235	25	243	4	2	6
Mississippi [2]	6	5	5	------	------	------	------	------	------	3	1	8
WEST SOUTH CENTRAL												
Arkansas	3	1	2	35	42	42	229	44	193	2	2	2
Louisiana	4	2	5	15	16	16	102	37	163	1	2	2
Oklahoma	0	2	3	69	79	79	344	27	136	2	1	1
Texas	34	35	29	635	778	778	2,107	535	2,197	9	6	7
MOUNTAIN												
Montana	4	0	1	4	2	2	123	17	106	0	0	0
Idaho	0	0	0	8	1	1	122	3	67	0	0	0
Wyoming	0	1	0	------	------	------	60	13	79	0	1	1
Colorado	4	2	4	20	4	25	890	38	279	0	0	1
New Mexico	1	3	1	1	------	2	24	16	65	0	0	0
Arizona	15	1	1	78	54	100	258	13	77	1	0	0
Utah [2]	0	0	0	3	2	2	565	104	164	1	0	0
Nevada	0	0	0	------	------	------	11	4	16	0	0	0
PACIFIC												
Washington	7	18	4	------	2	3	786	58	133	2	3	3
Oregon	7	12	3	2	13	13	315	66	203	1	6	1
California	12	22	13	29	20	71	3,823	1,536	1,536	8	22	22
Total	316	244	243	1,466	1,507	2,668	40,746	4,179	27,161	131	194	194
15 weeks	5,568	4,478	4,370	179,321	54,658	67,152	301,196	40,379	262,946	2,837	3,617	3,617

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended April 13, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945		Apr. 13, 1946	Apr. 14, 1945	
NEW ENGLAND												
Maine	1	0	0	31	41	15	0	0	0	1	0	1
New Hampshire	0	0	0	8	15	8	0	0	0	0	0	0
Vermont	0	0	0	12	7	7	0	0	0	0	0	0
Massachusetts	0	0	0	202	306	450	0	0	0	1	1	1
Rhode Island	0	0	0	22	45	15	0	0	0	0	0	0
Connecticut	0	0	0	70	71	71	0	0	0	2	0	0
MIDDLE ATLANTIC												
New York	4	9	2	912	522	335	0	0	0	0	3	1
New Jersey	2	1	0	190	133	167	0	0	0	1	0	0
Pennsylvania	1	2	1	405	578	420	0	0	0	4	4	5
EAST NORTH CENTRAL												
Ohio	0	0	0	401	202	296	1	0	1	0	1	1
Indiana	1	0	0	83	105	122	1	3	1	0	3	1
Illinois	1	1	0	203	284	284	0	2	2	0	2	4
Michigan [2]	0	4	0	160	238	238	0	0	0	4	0	1
Wisconsin	0	1	1	131	168	168	0	0	0	3	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	62	87	76	0	0	0	0	0	0
Iowa	1	0	0	50	60	57	0	1	1	0	0	0
Missouri	0	0	0	56	47	116	0	0	2	0	0	0
North Dakota	0	0	0	8	39	22	0	0	0	0	0	0
South Dakota	0	0	0	6	20	20	0	0	0	0	0	0
Nebraska	0	1	0	38	58	36	2	0	0	0	0	0
Kansas	1	0	0	72	82	82	0	1	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	7	13	19	0	0	0	1	0	0
Maryland [2]	0	0	0	83	173	148	0	0	0	1	0	0
District of Columbia	0	0	0	21	28	18	0	0	0	1	0	0
Virginia	0	0	0	85	82	39	0	0	0	1	0	1
West Virginia	0	0	0	39	42	38	0	0	0	0	0	4
North Carolina	0	0	0	37	63	39	0	0	0	0	3	2
South Carolina	0	0	0	8	7	4	0	0	0	0	1	1
Georgia	0	0	0	8	23	17	0	0	0	1	4	3
Florida	2	1	0	3	10	8	0	0	0	1	1	1
EAST SOUTH CENTRAL												
Kentucky	0	0	1	19	45	73	0	0	0	2	4	4
Tennessee	0	2	1	25	27	14	0	0	0	1	8	1
Alabama	0	0	1	65	16	16	0	0	0	0	2	1
Mississippi [2]	1	0	0	4	13	10	0	0	0	3	0	1
WEST SOUTH CENTRAL												
Arkansas	2	0	0	5	10	7	0	1	3	0	3	1
Louisiana	2	0	0	7	13	8	0	0	0	3	3	4
Oklahoma	0	1	0	16	9	16	0	1	1	0	0	0
Texas	6	3	2	29	91	63	0	1	1	11	7	6
MOUNTAIN												
Montana	0	0	0	17	15	20	0	0	0	0	0	0
Idaho	0	0	0	12	28	28	0	0	0	1	0	0
Wyoming	0	0	0	7	41	22	0	0	0	0	0	0
Colorado	0	0	0	23	45	45	0	0	0	1	0	0
New Mexico	0	0	1	9	17	10	0	0	0	1	1	1
Arizona	0	0	0	13	35	11	*0	0	0	2	2	0
Utah [2]	0	0	0	35	30	30	0	0	0	0	0	0
Nevada	0	0	0	0	0	4	0	0	0	0	0	0
PACIFIC												
Washington	1	0	0	30	71	44	8	0	0	0	0	0
Oregon	0	0	0	32	41	38	0	0	0	0	0	1
California	3	1	2	201	444	102	0	0	0	2	0	2
Total	29	36	19	3,071	4,660	4,483	12	10	21	49	53	67
15 weeks	575	521	371	52,463	83,891	59,767	*149	160	343	683	834	1,078

[2] Period ended earlier than Saturday.

[3] Including paratyphoid fever reported separately, as follows: Connecticut 2; New Jersey 1; Michigan 1; Georgia 1; Tennessee 1; Colorado 1.

*Correction: Arizona, week ended Mar. 30, smallpox 0 (instead of 1 case).

Telegraphic morbidity reports from State health officers for the week ended Apr. 13, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended Apr. 13, 1946							
	Week ended—		Median 1941-45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Apr. 13, 1946	Apr. 14, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	17	22	22								
New Hampshire	1										
Vermont	32	19	13								4
Massachusetts		151	151		1		1				1
Rhode Island	18	29	26								
Connecticut	45	76	40	2							
MIDDLE ATLANTIC											
New York	163	219	283	5	35		2		1		
New Jersey	124	121	121		1	2					1
Pennsylvania	111	161	163		1		1				1
EAST NORTH CENTRAL											
Ohio	71	133	187			1					4
Indiana	35	9	23			1					
Illinois	75	39	76	3							2
Michigan [2]	93	59	135	3	1						7
Wisconsin	104	53	88								6
WEST NORTH CENTRAL											
Minnesota	9	8	30	2			1				3
Iowa	11	3	17	1							1
Missouri		11	18								
North Dakota	6	1	7								
South Dakota		3	2								
Nebraska		2	11								
Kansas	15	28	63	2							6
SOUTH ATLANTIC											
Delaware		1	1						2		
Maryland [2]	19	66	64			1	1		1		1
District of Columbia	4	8	18								
Virginia	27	157	125			52			1		1
West Virginia	20	26	30								1
North Carolina	92	94	105	1	1				1	1	
South Carolina	79	93	89	1	5					1	
Georgia	35	21	21	2					4	6	1
Florida	4	24	17	2						8	1
EAST SOUTH CENTRAL											
Kentucky	57	31	40		2						
Tennessee	31	20	29				1				1
Alabama	4	17	18							4	
Mississippi [2]									4	1	2
WEST SOUTH CENTRAL											
Arkansas	7	6	11						1	2	3
Louisiana		3	8	1						2	1
Oklahoma	9	10	10								
Texas	182	351	337	19	209	13			1	13	16
MOUNTAIN											
Montana		2	12						1		
Idaho	6	3	3								
Wyoming	10	2	2					4			1
Colorado	40	15	39								2
New Mexico	2	1	19								
Arizona	14	33	26			22					
Utah [2]	34	18	58								
Nevada			4								
PACIFIC											
Washington	27	9	50								1
Oregon	19	10	18								2
California	51	378	378	1	5						2
Total	1,703	2,551	3,645	45	261	92	7	4	17	38	73
Same week, 1945	2,551			13	310	56	7	2	11	26	103
Average, 1943-45	2,818			24	245	64	10	[4] 4	12	[4] 26	
15 weeks: 1946	27,101			563	4,252	1,547	119	10	294	692	1,134
1945	36,627			417	6,783	1,771	106	6	267	727	1,287
Average, 1943-45	41,344		[4] 57,746	417	4,271	1,133	141	[4] 7	225	[4] 586	

[2] Period ended earlier than Saturday.
[4] 5-year median, 1941-45.

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 6, 1946

This table lists the reports from 84 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	1	0	------	0	----	0	2	0	0	0	0	5
New Hampshire:												
Concord	0	0	------	0	------	1	1	0	2	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	1	0	0	------
Massachusetts:												
Boston	3	0	------	0	423	1	4	0	59	0	0	19
Fall River	0	0	------	0	10	0	2	0	3	0	0	1
Springfield	0	0	-----	0	24	0	0	0	1	0	1	1
Worcester	0	0	-----	0	198	0	7	0	3	0	0	15
Rhode Island:												
Providence	0	0	2	0	------	0	0	0	2	0	0	22
Connecticut:												
Bridgeport	0	0	1	1	-----	0	0	0	6	0	0	2
Hartford	0	0	------	0	2	0	0	1	2	0	0	2
New Haven	0	0	-----	0	48	0	3	0	5	0	0	-----
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	-----	0	268	1	5	0	8	0	0	18
New York	24	0		1	1,385	23	47	1	475	0	2	27
Rochester	0	0	------	0	704	0	3	0	19	0	0	4
Syracuse	0	0	------	0	98	0	1	0	6	0	0	5
New Jersey:												
Camden	1	0	----	0	64	0	3	0	6	0	0	3
Newark	0	0		0	1,110	0	1	0	17	0	0	11
Trenton	0	0	------	0	13	0	1	0	4	0	0	2
Pennsylvania:												
Philadelphia	1	0	2	1	816	2	18	0	73	0	1	29
Pittsburgh	0	0	3	0	8	2	14	0	33	0	0	3
Reading	0	0	----	0	315	0	2	0	6	0	0	17
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0		0	112	1	5	0	12	0	0	1
Cleveland	0	0	--	1	41	2	3	0	33	0	0	24
Columbus	5	0	-----	0	4	0	1	0	16	0	0	1
Indiana:												
South Bend	0	0	------	0	3	0	0		5	0	0	-----
Terre Haute	1	0	-----	0	41	0	2	0	1	0	0	1
Illinois:												
Chicago	0	0	2	2	537	8	30	0	76	0	0	58
Michigan:												
Detroit	1	0		0	1,043	2	16	0	55	0	2	38
Flint	0	0	-----	0	8	0	2	0	5	0	0	-- --
Grand Rapids	0	0	------	0	139	1	0	0	8	0	0	13
Wisconsin:												
Kenosha	0	0	------	0	1	0	0	0	1	0	0	------
Milwaukee	0	0	1	1	1,497	1	2	0	28	0	0	60
Racine	0	0	------	0	10	0	0	0	4	0	0	---
Superior	0	0	------	0	------	0	0	0	0	0	0	3
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	9	0	1	0	1	0	0	1
Minneapolis	4	0	------	1	14	2	5	0	12	0	0	1
Missouri:												
Kansas City	1	0		1	49	0	6	0	11	0	0	2
St. Louis	3	0	1	0	106	1	13	0	14	0	0	1

City reports for week ended Apr. 6, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	0	------	0	61	0	2	0	6	0	0	------
Kansas:												
Topeka	0	0	------	0	21	0	4	0	11	0	0	------
Wichita	0	0	------	0	63	0	2	0	7	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	21	0	3	0	3	0	0	1
Maryland:												
Baltimore	17	0	2	1	413	0	6	0	38	0	0	13
Cumberland	0	0	------	0	1	0	0	0	11	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	0	285	1	5	0	24	0	0	6
Virginia:												
Lynchburg	0	0	------	0	17	0	1	0	3	0	0	------
Richmond	0	0	------	0	14	0	0	0	5	0	0	------
Roanoke	0	0	------	0	15	0	0	0	3	0	0	2
West Virginia:												
Charleston	0	0	------	0	2	0	0	0	1	0	0	------
Wheeling	1	0	------	0	3	0	3	0	1	0	0	30
North Carolina:												
Raleigh	0	0	------	0	74	0	2	0	0	0	0	2
Wilmington	0	0	------	0	21	0	3	0	0	0	0	------
Winston-Salem	0	0	------	0	18	0	2	0	1	0	0	21
South Carolina:												
Charleston	0	0	------	0	22	0	0	0	0	0	0	------
Georgia:												
Atlanta	0	0	------	0	8	1	3	0	4	0	0	------
Brunswick	0	0	------	0	3	0	0	0	0	0	0	------
Savannah	0	0	------	0	1	0	2	0	0	0	0	------
Florida:												
Tampa	1	0	------	0	37	1	1	0	3	0	0	3
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	1	46	0	15	0	5	0	0	10
Nashville	0	0	------	0	17	0	1	0	0	0	0	------
Alabama:												
Birmingham	0	0	------	0	5	0	4	0	0	0	0	------
Mobile	1	0	2	3	6	1	1	1	0	0	3	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	4	0	13	0	0	0	3	0	0	------
Louisiana:												
New Orleans	1	0	------	0	15	1	5	0	8	0	0	------
Shreveport	0	0	------	0	------	0	3	0	0	0	1	------
Texas:												
Dallas	1	0	------	0	29	1	5	1	3	0	0	------
Galveston	0	0	------	0	7	0	1	0	0	0	0	------
Houston	1	0	------	0	16	3	4	0	1	0	5	------
San Antonio	2	0	1	0	64	0	8	0	0	0	1	3
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	1	0	0	------
Great Falls	0	0	------	0	4	0	2	0	1	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	1	0	0	0	0	------
Colorado:												
Denver	3	0	2	0	651	0	2	1	10	1	1	16
Pueblo	0	0	------	0	31	0	1	0	1	0	0	6
Utah:												
Salt Lake City	0	0	------	1	133	0	2	0	4	0	0	6

City reports for week ended Apr. 6, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0	------	0	148	0	5	0	5	4	0	8
Spokane	0	0	------	0	123	0	2	0	1	0	0	------
Tacoma	0	0	------	0	10	0	0	0	6	0	0	3
California:												
Los Angeles	1	0	13	0	520	2	3	0	64	0	0	11
Sacramento	1	0	1	1	208	0	3	0	1	0	0	3
San Francisco	0	0	5	1	510	2	10	0	21	0	1	5
Total	81	0	42	17	12,894	61	317	5	1,275	5	18	542
Corresponding week, 1945	66	------	55	10	1,028	------	330	------	1,497	0	5	512
Average, 1941-45	61	------	128	[1] 31	[2] 7,115	------	[1] 425	------	1,701	1	12	838

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia 2.
Dysentry, amebic.—Cases: New York 2; Chicago 2; San Francisco 1.
Dysentry, bacillary.—Cases: New York 5; Chicago 2; Baltimore 3; Los Angeles 1.
Dysentry, unspecified.—Cases: Baltimore 1; San Antonio 12.
Typhus fever, endemic.—Cases: Tampa 2; San Antonio 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 84 cities in the preceding table (estimated population, 1943, 33,422,000)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	10.5	0.0	7.8	2.6	1,921	5.2	40.7	2.6	235	0.0	2.6	183
Middle Atlantic	13.4	0.0	2.3	0.9	2,213	13.0	44.0	0.5	290	0.0	1.4	55
East North Central	4.6	0.0	2.0	2.6	2,248	9.8	40.0	0.0	160	0.0	1.3	130
West North Central	20.9	0.0	2.3	4.6	756	7.0	76.5	0.0	144	0.0	0.0	12
South Atlantic	31.1	0.0	3.3	1.6	1,566	4.9	50.7	0.0	159	0.0	0.0	127
East South Central	5.9	0.0	11.8	23.6	437	5.9	123.9	5.9	30	0.0	17.7	59
West South Central	14.3	0.0	14.3	0.0	413	14.3	74.6	2.9	43	0.0	20.1	19
Mountain	23.8	0.0	15.9	7.9	6,505	0.0	63.5	7.9	135	7.9	7.9	222
Pacific	6.3	0.0	30.0	3.2	2,559	6.3	36.4	0.0	155	6.3	1.6	47
Total	12.7	0.0	6.6	2.7	2,017	9.5	40.6	0.8	199	0.8	2.8	85

PLAGUE INFECTION IN SAN BENITO, SAN LUIS OBISPO, AND VENTURA COUNTIES, CALIF.

Under dates of April 1, 2, and 12, 1946, plague infection has been reported proved in specimens of tissue and fleas from rodents in California as follows:

San Luis Obispo County.—In tissue from a squirrel, species not stated, found dead about 1 mile north of Pozo, in the northeast quarter of section 16, township 30, south range 15 E., received at laboratory March 1 and proved positive March 22.

San Benito County.—In a pool of organs from 7 field mice, *Microtus* sp., trapped 7 miles east and 5 miles south of Tres Pinos, proved positive March 15; in a pool of 207 fleas from 4 ground squirrels, *C. beecheyi*, found dead 5 miles east of Tres Pinos, proved positive March 25.

Ventura County.—In tissue from 1 rat, *R. norvegicus*, taken 2 miles east of Santa Paula, proved positive April 7.

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

Up to April 17 no new cases of smallpox had been reported in San Francisco since March 27, the date of onset of the latest reported local case. A total of 9 cases has been reported in the city—3 with origin outside the United States and 6 with origin within the city. In addition, 4 cases have been reported as arriving on two transports in the San Francisco area, and 1 case in a member of the Armed Services arriving at Camp Beale (Marysville) on April 6. This patient left Yokohama on March 21, and arrived at Seattle on April 4. Onset of prodromes reported on April 5, appearance of rash on April 6. Also one case of smallpox of local origin has been reported in San Diego.

Up to April 15, 38 cases of smallpox, with 10 deaths, had been reported in the Seattle-King County area, Washington, and 3 cases outside (1 each in Longview, Friday Harbor, and Waterville, not associated with the Seattle cases)—a total of 41 cases and 10 deaths. Of the deaths, 8 were reported as definitely due to smallpox, 1 was in a person with a long-standing illness upon which was superimposed a very mild varioloid, and 1 was a case of fulminating illness suspected of being hemorrhagic smallpox.

DEATHS DURING WEEK ENDED APRIL 6, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended April 6, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	9,037	9,121
Average for 3 prior years	9,367	
Total deaths, first 14 weeks of year	141,698	135,364
Deaths under 1 year of age	605	587
Average for 3 prior years	617	
Deaths under 1 year of age, first 14 weeks of year	8,483	8,955
Data from industrial insurance companies:		
Policies in force	67,106,295	67,188,314
Number of death claims	13,151	15,492
Death claims per 1,000 policies in force, annual rate	10.2	12.0
Death claims per 1,000 policies, first 14 weeks of year, annual rate	11.2	11.0

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 16, 1946.—During the week ended March 16, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		3		65	212	24	17	31	79	431
Diphtheria		2	1	16	6	2	1	2		30
German measles				26	27		2	10	11	76
Influenza		27			42	20			31	120
Measles		206	6	658	1,461	11	4	47	69	2,462
Meningitis, meningococcus					3					3
Mumps				144	336	111	11	50	149	801
Poliomyelitis					2					2
Scarlet fever		9	5	66	76	18	2	10	15	201
Tuberculosis (all forms)		2	9	92	53	22	4	27	60	269
Typhoid and paratyphoid fever				9	7		4	1	1	22
Undulant fever					3					3
Venereal diseases:										
Gonorrhea		22	12	72	172	63	56	47	76	520
Syphilis		22	6	134	110	13	20	13	37	355
Whooping cough				66	58			6		130

CUBA

Habana—Communicable diseases—4 weeks ended March 30, 1946.—During the 4 weeks ended March 30, 1946, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	1		Measles	1	
Chickenpox	10		Tuberculosis	6	1
Diphtheria	17		Typhoid fever	30	4
Malaria	1				

MADAGASCAR

Notifiable diseases—Year 1945.—During the year 1945, cases of certain notifiable diseases were reported in Madagascar and its dependencies as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	417	Poliomyelitis	4
Diphtheria	52	Recurrent fever	2
Dysentery, unspecified	176	Scarlet fever	1
Leprosy	79	Trachoma	15
Measles	477	Typhoid fever	491
Plague	184		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China.—Cholera has been reported in China as follows: Canton, March 1–20, 1946, 31 cases, 2 deaths; Fukien Province, March 26, 1 case; Hupeh Province, March 1–20, 1946, 28 cases, 4 deaths.

Plague

China—Fukien Province—Loyuan.—On March 25, 1946, 1 case of plague was reported in Loyuan, Fukien Province, China.

Manchuria.—Plague has been reported in Manchuria as follows: Week ended March 16, 1946, 8 deaths from pneumonic plague in Liaopeh Province, for the period February 26 to March 15, 1946, 19 deaths were reported in Mukden.

Smallpox

British East Africa—Tanganyika.—For the week ended March 9, 1946, 350 cases of smallpox with 52 deaths were reported in Tanganyika, British East Africa. These figures include delayed reports.

Typhus Fever

Bulgaria.—For the week ended March 16, 1946, 64 cases of typhus fever were reported in Bulgaria.

Egypt.—Typhus fever has been reported in all of Egypt as follows: Weeks ended—March 9, 1946, 41 cases, 9 deaths, March 16, 1946, 71 cases.

Tunisia.—Typhus fever has been reported in Tunisia as follows: March 1-10, 1946, 22 cases; March 11–20, 1946, 23 cases.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

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Public Health Reports

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Public Health Reports

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HOW DOES HOUSING AFFECT HEALTH? [1]

By M. Allen Pond, *Sanitary Engineer (R) United States Public Health Service* [2]

It has been impossible up to the present to prove many specific relationships between housing and health. Creditable studies conducted in recent years have shown that people who live in good housing are, in the main, healthier than those who live in substandard dwellings. For certain diseases, notably the enteric infections and tuberculosis, morbidity and mortality rates for those who live in sound, sanitary structures are significantly lower than for families and individuals living in substandard housing. Sharp differences in respiratory disease rates have been demonstrated as being related to the degree of room crowding. Recent reports of the relationship of physical environment to draftee rejection rates for specific physical defects also have focused attention on the cumulative effects of bad housing.

Britten (*1*) has shown that the common communicable diseases of childhood occur more frequently and at an earlier age in crowded households than in uncrowded ones. He points out that the "secondary" attack rate for tuberculosis is about 200 percent greater for relief families living in overcrowded households than for all income groups living with less than one person per room.

On the basis of National Health Survey findings, Britten and Altman (*2*) state that the percentage of persons disabled for a week or longer was higher in households with more than one and a half persons per room than in homes with one or less persons per room. The pneumonia case rate for crowded households (more than one and one-half persons per room) was approximately 68 percent higher than for homes with one person or less per room. Incidentally, it was found during the National Health Survey that 4.0 percent of the

[1] Read at the Colorado Conference of Social Welfare, Denver, Nov. 13, 1945.
[2] Sanitary Engineer Consultant to Federal Public Housing Authority.

households visited had two or more persons per room, 6.3 percent had more than one and one-half persons per room, and there was more than one per room in 17.6 percent of the households (*3*).

M'Gonigle (*4*) has noted a significant decrease in the mortality rate for infants born into families who have been moved from slums to satisfactory housing. However, on the basis of his carefully controlled study he states: "It appears reasonable to assume that the increase in the [general] death-rate of the population * * * subsequent to its transfer * * * is a real increase, and is beyond the probable extent of fortuitous variation." He then goes on to show that the rehoused families tended to spend more of their limited income for shelter after moving into the housing project, that less money was available for food, and as a result the diets of the rehoused families suffered.

According to Hadley (*5*), slum areas in the District of Columbia show Army rejection rates for personality disorders one and one-half times as great as areas with good housing His study was based on a sample of 5,800 induction physical examinations made at Fort Meyer, Va., during the 2-year period ending in May 1944. He correlated physical examination findings with data collected in the 1940 Housing Census.

Hyde and Kingsley (*6*), (*7*) had previously studied the relation of mental disorders to the community socioeconomic level and to population density in eastern Massachusetts. Their sample was 60,000 selectees examined at the Boston Armed Forces Induction Station during the winter, spring, and summer months of 1941–42. The total incidence of mental disorders, the rate of mental deficiency, and the rate of psychopathic personality increased significantly from the best to the poorest communities. They concluded that there is a need for intensive study in places of different population density regarding the influence of the community environment on mental health.

A major qualification is necessary in regard to these community studies of mental disease incidence: The excess rejection (incidence) rates in slum and substandard areas are not necessarily to be ascribed to housing per se. However, such studies as these establish an interesting correlation between bad housing and mental disease.

Other statistical studies of the relationship of housing to health might be cited, but an assiduous search of the literature reveals nothing that demonstrates the precise effects of bad or good housing on the occupants. There are several reasons why it has not been possible to relate health specifically to housing. Substandard housing probably never is the only factor working to the detriment of health. Attention has repeatedly been drawn to the fact that the slum is but a symptom of low economic status. Wherever poor housing exists,

there also is to be found poverty and its attendant ills—crowding, illiteracy, poor nutrition, and delinquency. Anderson (*8*) summarized this point of view as follows:

> Of the many newer aspects of environmental sanitation, the standards of housing seem to rest on especially insecure epidemiological foundation. I would not question the potential health significance of housing, and yet epidemiological data on which to base this belief are virtually nonexistent for poor housing cannot be separated from other attributes of poverty.
>
> This inability to secure epidemiological support for housing standards should not discourage us from attempts to improve housing conditions or even to do so by regulation. Almost every community has houses that by no stretch of the imagination can be defended as desirable for human habitation. An appreciable fraction of our population lives under conditions that are undesirable socially, morally, and hygienically. Housing needs no defense nor need it await epidemiological support.

Although there is little evidence that substandard housing per se causes sickness and death, there is some indication that improved housing tends to better the health of population groups. Incomplete studies of the health of slum dwellers who have been rehoused in public-housing projects in several cities indicate that their morbidity experience improves after they have left slum dwellings. It must be pointed out, however, that community interests developed among the tenants of public-housing projects may well result in the improvement of their nutrition and in making them more conscious of, and hence more alert to use, local public health and preventive medical services. Furthermore, it is easier to provide these people with health services.

What is the meaning of these several comments? A cautious and critical analysis of available data relating to the effects of housing on health leads to but one conclusion: One cannot state that substandard housing alone begets ill health. However, no reasonable student of the subject has yet stated that bad housing is compatible with good health. In the absence of irrefutable proof that housing has no ill effect on health, it may reasonably be hypothesized that good housing promotes the attainment of good health. Simply because we have not yet proved the case does not mean that the case cannot be proved.

A joint committee has recently been organized by the American Public Health Association and the National Association of Housing Officials to suggest standards for "housing and health" studies. Within the foreseeable future, housing and health officials should have a competent guide to use in studying the health effect of rehousing slum dwellers in decent homes. There is of course no assurance that the type of information so avidly wanted by many people will come out of studies that may be made.

Almost a decade ago the American Public Health Association organized a permanent Committee on the Hygiene of Housing. One of the earliest publications of the committee has become a landmark. The Basic Principles of Healthful Housing (*9*) which appeared originally in 1939 and was revised and reissued in 1941, contains 30 basic principles with specific requirements and suggested methods of attainment for each. These principles are grouped under 4 broad headings:

Fundamental physiological needs.
Fundamental psychological needs.
Protection against contagion.
Protection against accidents.

Fundamental Physiological Needs

The fundamental physiological needs of healthful housing involve:

1. Maintenance of a thermal environment which will avoid undue heat loss from the human body.
2. Maintenance of a thermal environment which will permit adequate heat loss from the human body.
3. Provision of an atmosphere of reasonable chemical purity.
4. Provision of adequate daylight illumination and avoidance of undue daylight glare.
5. Provision for admission of direct sunlight.
6. Provision of adequate artificial illumination and avoidance of glare.
7. Protection against excessive noise.
8. Provision of adequate space for exercise and for the play of children.

Techniques have not been developed for relating each of these factors to the public health. However, numerous data have been collected concerning the effects of heating and ventilation on human subjects. Present knowledge emphasizes the probable relationship of housing provided with unsatisfactory heating and ventilation systems to morbidity from upper respiratory disease.

There are several methods to control air-borne infections in enclosed spaces (*10*). Dilution of air, reduction in crowding, disinfectant radiation, and disinfectant vapors are environmental controls that should be of interest to the builders and operators of housing. Do we have to wait for further and more specific information concerning the relation of substandard housing to the spread of air-borne infection before attempting to work out practical ways of applying control measures? Can't we use the facts now at our disposal concerning the distribution of air-borne bacteria to promote interest in the elimination of overcrowded, ill-ventilated, and poorly heated dwelling units? Are such facts less useful than those showing a general relationship between housing and health?

There have been numerous studies of the relationship of illumination intensities to working efficiency. In 1924, Thompson (*11*) and his associates demonstrated the need for controlling glare and providing

at least 10 foot-candles on the working plane. Later work confirmed these conclusions. However, there still is need for objective inquiries into the effects of different qualities and intensities of artificial light on eye health. In the meantime, the principles concerning illumination and the methods of attainment suggested by the Committee on the Hygiene of Housing are reasonable in terms of present knowledge.

The scientific measurement of recreational needs of urban dwellers is difficult if not impossible. No basic information on this subject has come to our attention. Relating recreational facilities or their absence to health would seem at the moment to be impossible.

Fundamental Psychological Needs

The fundamental psychological needs of humans, as defined by the Committee on the Hygiene of Housing involve the following principles:

1. Provision of adequate privacy for the individual.
2. Provision of opportun ties for normal family life.
3. Provision of opportunities for normal community life.
4. Provision of facilities which make possible the performance of tasks of the household without undue physical and mental fatigue.
5. Provision of facilities for maintenance of cleanliness of the dwelling and of the person.
6. Concordance with prevailing social standards of the local community.

As mentioned above, there is some evidence that slum homes contribute to personality difficulties. However, the presently available techniques for measuring cause and effect in relation to psychiatric problems are fragmentary, and it is impossible to draw specific conclusions from data presented in the literature. In the aggregate it is evident that the psychological principles set forth here are sound and should be considered seriously in any housing program.

Protection Against Contagion

Protection against contagion involves:

1. Provision of a water supply of safe sanitary quality, available to the dwelling.
2. Protection of the water supply system against pollution within the dwelling.
3. Provision of toilet facilities of such a character as to minimize the danger of transmitting disease.
4. Protection against sewage contamination of the interior surfaces of the dwelling.
5. Avoidance of insanitary conditions in the vicinity of the dwelling.
6. Exclusion from the dwelling of vermin which may play a part in the transmission of disease.
7. Provision of facilities for keeping milk and food undecomposed.
8. Provision of sufficient space in sleeping rooms, to minimize the danger of contact infection.

The relationship of water supply, food, insects, and rodents to the spread of contagion has been known since the development of the

germ theory of disease based on the research of Pasteur, Koch, Reed, and others working during the last quarter of the nineteenth century. This knowledge has provided means for mass attack on epidemic diseases such as septic sore throat, typhoid fever, malaria, yellow fever, rat-borne typhus, and plague. The result of engineering control of the environment has been the dramatic reduction in incidence of many communicable diseases and the virtual elimination of others as causes of death. As Underwood (*12*) has said: "One of the outstanding contributions of all times to mankind's security and comfort has been the environmental control of disease which the application of scientific sanitary principles has made possible."

The sanitarian until recently has been primarily concerned with the use of engineering methods to control disease. For example, he has used filtration and chlorination to prevent the spread of water-borne infection, and has developed pasteurization to destroy pathogenic organisms in milk. These control measures, applied at a few points in the community, have affected the whole population.

In the future—and particularly with respect to housing—sanitary principles will have to be applied at numerous points within a community to produce the desired results. Whereas one chlorinator may control contamination in the entire water supply, the improvement of heating or ventilation or illumination involves work in each occupied structure. Hence, new engineering and administrative procedures will have to be developed and applied to make further advances in the environmental control of morbidity. Incidentally, this does not mean that building and plumbing codes need to be made more restrictive. On the contrary, codes in most communities should be liberalized so that advantage may be taken of new materials and modern construction methods.

Protection Against Accidents

Protection against accidents involves:

1. Erection of the dwelling with such materials and methods of construction as to minimize danger of accidents due to collapse of any part of the structure.
2. Control of conditions likely to cause fires or to promote their spread.
3. Provision of adequate facilities for escape in case of fire.
4. Protection against danger of electrical shocks and burns.
5. Protection against falls and other mechanical injuries in the home.
6. Protection of the neighborhood against the hazards of automobile traffic.

Britten (*1*) has shown that as the rental or value of the house goes down, the rate of home accidents goes up. Data on accidents and injuries collected by the National Safety Council and the National Board of Fire Underwriters indicate that there is much that can be done in the design and construction of dwellings so that hazards can be reduced to a minimum. Relationship of faulty construction to

accidental injury and death can be more precisely drawn than can the general connection between substandard housing and ill health. Hence, anyone looking for specific reasons for improving substandard housing and eliminating basically deficient housing can find many examples in the literature on fire and accident hazards.

It may appear that undue emphasis has been placed on the design and construction of housing to the exclusion of less tangible but equally important operational factors. Housing is not simply bricks and mortar. It is a complex of shelter and people, interrelated and mutually important. Even the best-built structure is subject to deterioration. Without careful management, including the provision of adequate services, ideally designed houses in time become substandard. One needs but to see the decay of once first-class residential areas in any of our American cities to realize the importance of maintaining good housing once it is built.

Health authorities can assist in promoting healthful living by making services readily available to all of the population. They can take advantage of the community groups that spring up in and around housing projects to stimulate immunization, to promote good nutrition, to sow the seed of personal hygiene. The health official should never assume, because several hundred people have moved out of hovels into a shiny new housing project, that the job of selling public health to these people is done. Indeed, it has barely begun.

Now, what can public housing do for the health of the community? (1) It can provide decent dwelling units for many who in all likelihood would never otherwise have them. (2) It can facilitate the work of the health department by making it possible for the promotion of good public health practices under conditions where these practices may be effectively applied. (3) It can set the stage for group action to improve personal health through fostering civic organization that is tragically lacking in most slum areas. Most adults are interested in health. If given the opportunity, they will do much for themselves to improve their own health habits, in turn strengthening formal community health services.

The problem of relating housing specifically to health is academically interesting. If we wait until this problem is solved before doing anything about providing decent housing for the millions of Americans who need it, the lives of many will doubtless be unnecessarily sacrificed. In spite of the general lack of measurable effects of bad housing on health, there is enough knowledge now to indicate that good housing is compatible with good health. There is an urgent need to devote our individual and collective energies to the improvement of the Nation's housing.

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Objective contemplation of the problem of relating housing to health brings the critical observer to the following conclusions:

Techniques are not now available for proving that the quality of housing alone has any effect on health.

It is possible to relate specific environmental factors involved in housing to the health of persons exposed to these factors.

Analysis of available gross data reveals that housing has not been eliminated as a contributory factor in the perpetuation of preventable disease.

The provision of structurally satisfactory housing, either public or private, is not an end in itself, but, rather, furnishes a means for the promotion of more healthful living.

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COMPARATIVE ASSAYS OF RODENTICIDES ON WILD NORWAY RATS

I. TOXICITY [1]

By Sally H. Dieke and Curt P. Richter

INTRODUCTION

There are two main qualifications which any rodenticide must have in order to produce effective results: (1) The poison must be sufficiently toxic to kill in reasonably small amounts, and (2) it must also be sufficiently acceptable so that the rodents will voluntarily

[1] From the Psychobiological Laboratory, Phipps Psychiatric Clinic, Johns Hopkins Hospital, Baltimore, Md. The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the Johns Hopkins University.

consume lethal quantities. In this paper the relative toxicities of various poisons are reported, as expressed in terms of median lethal doses for wild Norway rats. A second paper will deal with the methods devised in this laboratory for quantitative study of the acceptance factor in wild rats and will give the information obtained through their use.

As the acceptance factor can be modified to a considerable extent by a proper choice of the bait in which the poison is offered, so also the toxicity factor can undoubtedly be influenced by a number of circumstances, depending on the properties of the individual rodenticides. Cumulative poisons, for instance, can be effective if consumed in small amounts over an extended period of time. The same is true of sensitizing poisons. On the other hand, for poisons to which tolerance is developed, the toxicity is unfavorably influenced by a slow rate of consumption. This will also be the case for poisons which are rapidly detoxified or otherwise quickly eliminated by the animal organism. The particle size of poisons with low solubilities is also known to influence their toxicity, presumably due to its effect on the rate of absorption.

Since toxicity can be influenced by so many factors, it was decided to test the poisons under uniform, and what might be called optimum, conditions. We chose to administer the various substances by stomach tube to starved rats so that the full impact from the dose would be received at one time and yet absorption would still take place from the alimentary tract as would be the case for voluntary ingestion. The vehicle chosen was 10-percent acacia, in which the water-soluble poisons dissolved readily, and which gave good suspensions of the others.

Toxicity values for most of the poisons here studied have already been published (*1*), (*2*), (*3*), (*4*), but we have not found bio-assays made on all of them under strictly comparable conditions. Furthermore, previous work has usually been done with laboratory animals, which do not necessarily have the same susceptibility as their wild counterparts. From the practical standpoint it was felt that assays performed with wild Norway rats would be of significant interest. We were fortunate in having a large and continuous supply of wild rats at our disposal, and also in having available the simplified technique for handling such animals, which will be described below.

METHODS

The 406 wild Norway rats used in this work were trapped in the back yards and alleys of Baltimore, Md., by the Municipal Rodent Control Office. They were caught in modified rabbit box traps described elsewhere (*5*) and held in the laboratory for a minimum of

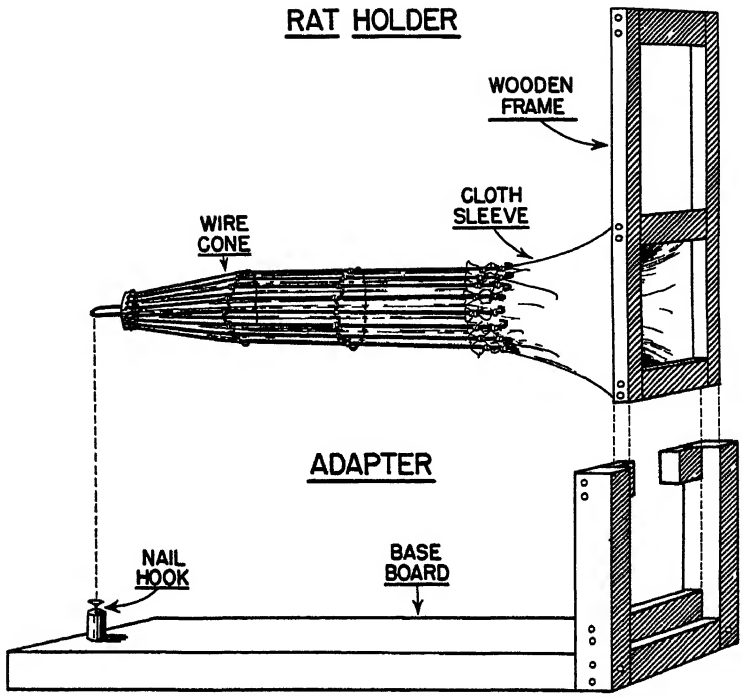
4 days, to allow for recuperation and also to make certain they were reasonably healthy and not under the influence of any poison encountered in the field. Care was taken to use only rats from areas which had not been subjected to systematic poisoning. It was obviously impossible, however, to be certain that the rats had not encountered some kind of poison as set out by individual householders. In any case the rats probably formed a representative sample of an urban rat population as met with in eradication campaigns.

Due to the possibility of variation in susceptibility on account of age, all the rats used were adult. The smallest weighed 111 and the largest 579 gm., with an average of about 300 gm. Of the total number 204 were males and 202 females, with equal numbers of males and females being generally used at each assay level in order to detect any possible sex variation in response.

The rats were kept in stock cages for 4 or more days, with water and purina fox chow available in excess. They were then transferred to individual cages and starved overnight After receiving poison the rats were given food immediately and observed until either death occurred or recuperation could be assumed (5 to 10 days, depending on the poison.) Most of the rats were autopsied, and data for those animals found to be definitely diseased were discarded. No surviving rat was used again.

The poisons were all prepared and administered in the same way. A sample (between 15 and 6,000 mg., depending on the substance being assayed) was weighed out on an analytical balance to the nearest tenth of a milligram and suspended (or dissolved) in 10-percent acacia solution by mortaring just before use. The particles of the relatively insoluble poisons so prepared were measured and found to have average dimensions between 5 and 10 microns, with some few of larger size observed in every case. For soluble poisons requiring assay below 5.0 mg. per kg. body weight a stock solution containing 5 mg. per 100 ml. was freshly prepared, in 10-percent acacia, and suitably diluted at the time of administration. At each assay level the rats received their doses in volumes of fluid proportional to their body weights, at the rate of 1 ml. per 100 gm. Thus a 342-gm. rat received 3.4 ml.

To handle the wild rats without anesthesia, an ingenious device due to Emlen (*6*) was used. This "sock" or wild rat holder is shown in figure 1. When the open end was placed against a vertical sliding cage door and the door lifted, the rat could be driven in with relative ease; in fact many rats rushed in without any urging at all. Once in the "sock" a rat was held immobile for weighing and tube feeding, and finally when the sock was replaced opposite the open door the rat could and did back out.



(Reproduced with permission from the Journal of Wildlife Management)

FIGURE 1.

For stomach tube a 4-inch 15-gage needle was employed, which had a smooth collar of solder replacing the sharp point. This is illustrated in figure 2. The rat's head was held close to the terminal ring of the "sock", by means of a loop of wire passed around the

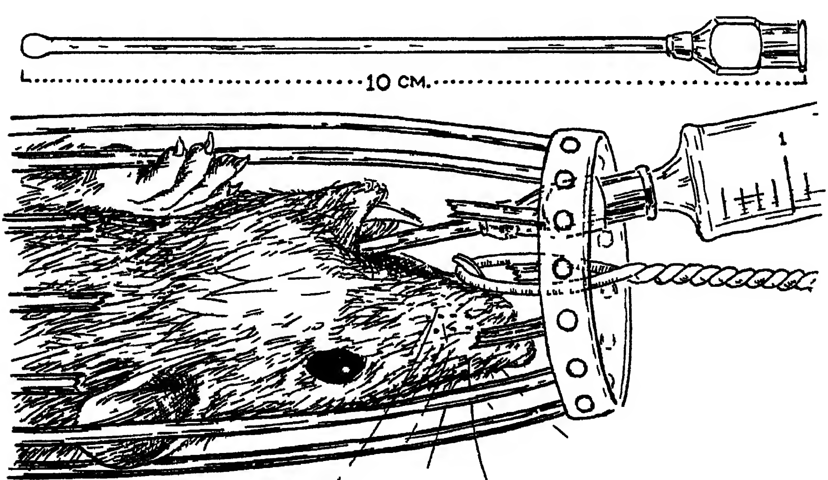


FIGURE 2.

upper incisors, and the tube was then slipped down the throat without forcing.

A minimum of practice in this technique made it possible to carry through the whole process of weighing and dosing with 20 to 25 rats per hour.

About half the rats were used in the initial assays, made during the winter months of November and December 1944 and January 1945. The assays were then repeated, using the remaining rats, in the summer months, June, July, and August 1945. In the interval the poisons were stored in stoppered containers under ordinary laboratory conditions. No significant differences in toxicity, such as might be ascribed to seasonal variation, were observed, and accordingly the two sets of observations were combined in calculating the LD_{50} values. It was found that the final toxicity values for arsenic trioxide and barium carbonate were higher than was indicated by the winter results alone, but since the slope of the dosage-mortality curve is not steep for these poisons, this difference was almost certainly due to an insufficient number of animals in the winter group. All the other values checked very satisfactorily.

The poisons used were as follows:

1. *Sodium fluoroacetate (1080).*—A white, flaky preparation, supplied by Dr. Ray Treichler, of the Fish and Wildlife Service, on December 26, 1944. Administered in solution.
2. *Strychnine sulfate—(Merck U. S. P.).*—A white crystalline powder. Administered in solution.
3. *Alphanaphthyl thiourea (ANTU).*—200-mesh, a fine greyish powder. Part of du Pont's factory lot 2, received April 29, 1944. Administered in suspension.
4. *Thallium sulfate*—(Tl_2SO_4).—Globe Brand, 200-mesh, a white powder (Tl_2SO_4 stated not less than 99.0 percent). Supplied by American Smelting and Refining Co., Denver, Colo., and received October 28, 1944. Administered in solution.
5. *Zinc phosphide*—(Zn_3P_2).—Presumably commercial grade, a fine black powder. Supplied by Mr. J. C. Ward, of the Fish and Wildlife Service, Denver, Colo., and received November 9, 1944. Administered in suspension.
6. *Arsenic trioxide*—(As_2O_3)—(Merck U. S. P.).—A fine white powder. Administered in suspension.
7. *Fortified red squill.*—A reddish powder, supplied by R. J. Prentiss & Co. as part of lot 11910, and received November 6, 1944. Administered in suspension.
8. *Barium carbonate*—($BaCO_3$).—A fine white powder, administered in suspension. C. P. Baker's, lot 52941.

RESULTS AND DISCUSSION

Table 1 shows the range of doses assayed for the various poisons, all entered against a single (roughly logarithmic) dosage scale in order to facilitate comparison of the results. The next highest dose follow-

ing the boldface (partial kill) levels may in general be taken as the LD_{100}. In this table the results for males and females are separated, making it clear that no significant sex variation was found except in the case of squill.

TABLE 1.—*Comparative killing ranges* [1]

Dose mg./kg.	1,080		Strychnine SO_4		ANTU		Tl_2SO_4		Zn_3P_2		As_2O_3		Squill		$BaCO_3$	
	25♂	30♀	34♂	28♀	22♂	28♀	19♂	18♀	18♂	17♀	20♂	21♀	33♂	34♀	31♂	28♀
0.1	0/1	0/3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
.2	1/8	3/8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
.3	8/10	9/10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
.5	1/1	7/7	0/3	0/1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1.0	4/4	-----	0/2	0/2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.0	-----	-----	0/3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3.0	-----	-----	0/2	1/6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
5.0	1/1	2/2	3/11	7/10	1/4	0/4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
7.5	-----	-----	5/5	5/5	10/11	6/16	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
10.0	-----	-----	3/3	1/1	5/6	5/5	0/2	0/3	-----	-----	-----	-----	-----	-----	-----	-----
15	-----	-----	2/2	2/2	-----	-----	2/7	4/8	-----	-----	-----	-----	-----	-----	-----	-----
20	-----	-----	3/3	1/1	1/1	3/3	8/9	3/4	0/2	-----	-----	-----	-----	-----	-----	-----
25	-----	-----	-----	-----	-----	-----	1/1	3/3	-----	-----	-----	-----	-----	-----	-----	-----
40	-----	-----	-----	-----	-----	-----	-----	-----	3/8	4/8	-----	-----	-----	-----	-----	-----
50	-----	-----	-----	-----	-----	-----	-----	-----	5/6	6/8	-----	-----	-----	0/4	-----	-----
75	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/4	0/4	-----	0/4	-----	-----
80	-----	-----	-----	-----	-----	-----	-----	-----	2/2	1/1	-----	-----	-----	-----	-----	-----
100	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/7	1/6	0/4	4/12	0/3	0/1
150	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3/8	4/8	0/4	1/4	-----	-----
200	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/8	4/4	-----	-----
250	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/1	3/3	3/8	-----	1/8	2/7
300	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2/4	-----	-----	-----
400	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/1	2/2	-----	-----
500	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3/3	1/1	1/8	2/8
750	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/2	0/2
1,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/4	2/4
1,500	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1/1	3/3	0/2	1/2
2,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2/4	3/4

[1] Mortality ratios (rats killed/rats used) are listed opposite the appropriate doses for each poison. Levels at which partial kills were obtained are printed in boldface.

Table 2 gives the various median lethal doses (LD_{50}) and their standard errors, as estimated from the observed data according to the method of Litchfield and Fertig (7). The number of rats used, their average weights, and the range of survival time for each poison are also given.

TABLE 2.—*Comparative toxicity data* [1]

Poison	Number of rats used	Weight of rats (avg. and range, gm.)	$LD_{50}\pm$ standard error (mg./kg.)	Survival time	Fish and Wildlife Service [2] approximate LD_{50} (mg./kg.)
1080	55	342.2 (168–494)	0.22±0.01	45–240 min.	3
Strychnine SO_4	62	306.1 (142–493)	4.8±0.4	12–90 min.	6
ANTU	50	299.6 (142–482)	6.9±0.5	16–30 hr	8
Tl_2SO_4	37	297.6 (134–579)	15.8±0.9	1.5–6 days	31
Zn_3P_2	35	249.9 (119–385)	40.5±2.9	.25–4 days	40
As_2O_3	41	253.0 (148–493)	138 ±13	.25–8 days	100
Squill (♀)	34	244.2 (111–452)	133 ±10	.25–4 days	----------
Squill (♂)	33	296.2 (159–465)	276 ±29	.25–3 days	400–600
$BaCO_3$	59	295.6 (143–468)	1,480 ±340	1–8.5 days	500–700

[1] Poisons in 10-percent acacia administered by stomach tube to wild Norway rats, starved overnight.
[2] Toxicity figures furnished for comparison by the Fish and Wildlife Service, U. S. Department of the Interior.

In the last column of table 2 are given, for comparison, LD_{50} values most kindly supplied to us by the Fish and Wildlife Service, United States Department of the Interior (*8*). These figures are estimates based on a number of assays in which adult laboratory rats of several strains were used, and were derived from observations on several different samples of the various substances. Confirming tests were made in most cases on captive wild rats. Figures were based on feeding tests of poison mixed with a "bio-assay bait" composed of dried bread crumbs and 5 percent mineral oil, except for strychnine which is not readily accepted and hence was assayed by stomach tube.

On the basis of toxicity alone, it is seen that, as listed in table 2, the eight poisons are arranged in descending order of effectiveness. A fraction of a milligram of 1080, for instance, might be sufficient to kill an ordinary-sized wild Norway rat, while half a gram or so of barium carbonate would probably be required for the same purpose. Of the intervening poisons a couple of milligrams up to somewhat more than a hundred milligrams appear necessary per rat.

A consideration of the data presented in tables 1 and 2 reveals that all but the last three substances are capable of killing in doses of less than 25 mg. per rat. Excepting thallium sulfate, lethal amounts of these first five poisons produced a majority of fatalities within the 24-hour period following administration. This comparison is, of course, valid only for the optimum conditions under which these assays were performed, and takes no account of acceptability, safety in use, convenience, or other considerations which can outweigh pure toxicity when it comes to field use. The influence of acceptability in changing this order of effectiveness will, for instance, be shown in the second paper of this series.

SUMMARY

Eight rodenticides were bio-assayed, using 406 recently trapped adult wild Norway rats. Unanesthetized rats were given the various poisons suspended (or dissolved) in 10-percent acacia solution, through a metal stomach tube. No significant seasonal variation was observed nor was there any sex variation (except in the case of red squill). The median lethal doses and their standard errors were found to be as follows, in milligrams per kilogram body weight:

1,080	0. 22 ± 0. 01
Strychnine sulfate	4. 8 ± 0. 4
ANTU	6. 9 ± 0. 5
Thallium sulfate	15. 8 ± 0. 9

Zinc phosphide	40.5	±2.9
Arsenic trioxide	138	±13
Fortified red squill:		
Females	133	±10
Males	276	±29
Barium carbonate	1,480	±340

ACKNOWLEDGMENTS

It gives us great pleasure to acknowledge at this time the interested assistance and wholehearted cooperation afforded us by the Fish and Wildlife Service of the United States Department of the Interior. In particular we wish to thank Mr. E. R. Kalmbach, Mr. J. C. Ward, and Dr. Ray Treichler for their efforts on our behalf.

We wish also to express our gratitude to the Rodent Control Office of the City of Baltimore for supplying us with wild rats.

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MALARIA

Numbers of Cases Reported by the State Health Officers in 1945 as Compared With Similar Data for the Years 1939–44 [1]

By BROCK C. HAMPTON, *United States Public Health Service*

The accompanying table shows the number of cases of malaria reported to the United States Public Health Service by the State health officers during 1945 and certain prior years. In 1944 and 1945 the State health officers were requested to report separately cases contracted within and cases contracted outside the United States, or, if such information should not be available, to report separately cases in the military and civilian population. These data were

[1] From the Division of Public Health Methods. (For similar reports for the first 4 months and first half year of 1945 see PUBLIC HEALTH REPORTS for Aug. 31, 1945, pp. 1019–1020, and Dec. 7, 1945, pp. 1467–1470.)

furnished in the annual State Summaries for 1944 and in the monthly reports for 1945. The figures for the years 1939–44 are from the final annual summaries, while those for 1945 are from the monthly reports and are provisional. However, in recent years the monthly figures have agreed fairly closely with those of the annual summaries.

Numbers of cases of malaria reported to the U. S. Public Health Service by the State health officers in 1945 and certain prior years [1]

Division and State	1939	1940	1941	1942	1943	1944				1945			
						Total	Place contracted			Total	Place contracted		
							Within continental United States	Outside continental United States [2]	Information not supplied		Within continental United States	Outside continental United States [2]	Information not supplied
New England:													
Maine	1	2	1	3	4	4	3	1	------	28	3	25	------
New Hampshire	------	------	7	------	2	2	------	2	------	4	------	4	------
Vermont	------	------	------	------	1	------	------	------	------	4	------	4	------
Massachusetts	14	7	10	18	116	572	6	566	------	1,031	4	1,027	------
Rhode Island	------	1	2	1	6	266	------	------	266	168	3	165	------
Connecticut	6	5	10	3	20	63	4	59	------	300	10	290	------
Middle Atlantic:													
New York	123	132	80	104	124	553	184	309	60	1,234	14	1,219	1
New Jersey	12	15	13	20	20	826	9	817	------	1,413	13	1,400	------
Pennsylvania	10	15	8	7	4	123	2	121	------	------	------	------	------
East North Central:													
Ohio	25	52	19	8	40	154	36	118	------	110	36	74	------
Indiana	54	28	18	------	282	430	80	350	------	643	6	637	------
Illinois	423	199	127	89	125	23	21	------	2	516	6	510	------
Michigan	70	60	31	23	269	242	37	205	------	473	6	467	------
Wisconsin	3	7	1	1	31	90	7	83	------	188	------	188	------
West North Central:													
Minnesota	23	8	9	1	27	60	------	20	40	296	------	295	1
Iowa	62	60	21	2	21	241	6	235	------	465	7	458	------
Missouri	137	100	59	77	115	223	46	177	------	426	65	361	------
North Dakota	2	------	------	------	4	5	------	5	------	1	1	------	------
South Dakota	------	------	------	------	4	17	------	17	------	7	------	7	------
Nebraska	------	------	1	1	1	2	------	2	------	13	1	12	------
Kansas	32	25	18	10	45	91	13	78	------	781	9	772	------
South Atlantic:													
Delaware	------	------	1	------	4	15	------	15	------	47	------	47	------
Maryland	5	14	22	13	14	23	3	18	2	586	3	583	------
District of Columbia	1	1	1	5	47	171	------	171	------	89	------	89	------
Virginia	150	108	73	69	177	713	37	676	------	832	31	801	------
West Virginia	5	9	7	8	1	22	3	19	------	175	7	168	------
North Carolina	629	629	237	248	185	154	154	------	------	554	402	152	------
South Carolina	12,03[illegible]	9,435	9,830	10,017	9,860	9,899	9,766	133	------	9,860	8,804	1,049	7
Georgia	2,998	2,500	1,122	981	525	519	416	103	------	915	461	454	------
Florida	435	147	145	146	119	522	23	499	------	655	27	628	------
East South Central:													
Kentucky	103	47	25	36	152	664	27	371	266	1,071	75	996	------
Tennessee	1,495	981	496	315	208	192	185	7	------	191	117	74	------
Alabama	6,986	9,442	4,838	4,369	3,233	2,882	2,271	611	------	2,913	2,472	441	------
Mississippi	44,422	11,237	36,845	31,639	25,062	23,133	22,677	456	------	18,764	18,397	367	------
West South Central:													
Arkansas	4,863	3,514	3,426	1,978	1,159	1,427	------	------	1,427	2,262	1,721	541	------
Louisiana	645	565	460	420	329	1,469	902	567	------	1,327	589	707	31
Oklahoma	1,972	1,874	1,751	1,517	1,421	1,408	1,359	49	------	1,141	1,085	52	4
Texas	4,540	6.606	8.068	7.678	8.266	8.073	7.498	575	------	8.969	7.194	1.775	------

See footnotes at end of table.

Numbers of cases of malaria reported to the U. S. Public Health Service by the State health officers in 1945 and certain prior years—Continued

Division and State	1939	1940	1941	1942	1943	1944 Total	1944 Place contracted: Within continental United States	1944 Place contracted: Outside continental United States[2]	1944 Place contracted: Information not supplied	1945 Total	1945 Place contracted: Within continental United States	1945 Place contracted: Outside continental United States[2]	1945 Place contracted: Information not supplied
Mountain:													
Montana	3	1	------	1	7	28	-----	28	------	32	[illegible]	27	------
Idaho	4	7	------	4	1	3	------	------	3	39	15	24	------
Wyoming	------	7	2	3	2	13	4	9	------	7	------	7	------
Colorado	9	3	2	3	30	36	2	34	------	[3] 830	2	828	------
New Mexico	23	90	36	14	11	13	11	2	------	70	6	64	------
Arizona	27	35	42	35	88	60	10	50	------	189	3	174	12
Utah	1	5	------	5	313	157	1	156	-----	112	1	[3] 111	------
Nevada	------	------	------	------	4	4	------	------	1	5	[illegible]	2	------
Pacific													
Washington	1	2	8	3	3	9	1	8	------	6	------	6	------
Oregon	14	33	41	50	19	450	22	428	------	54	7	47	------
California	294	172	162	146	2,048	1,583	52	940	591	1,911	60	1,718	133
Total	82,655	78,130	68,075	60,071	54,555	57,629	45,878	9,090	2,66[illegible]	61,707	41,671	19,847	189

[1] Figures for the years 1939–44, inclusive, are from the Annual Summaries (final figures); those for 1945 are from the Monthly State Morbidity Reports and are provisional.
[2] Stated either to have been contracted outside continental United States or to be in the military population.
[3] Exclusive of 16 cases in prisoners of war.

The malaria cases reported by the State health officers for the years 1939 through 1942 may be considered as cases among civilians, contracted within the continental United States; those for 1943 probably included some cases in the military population in which the infection was acquired outside the United States. This is probably the reason for the sharp increase in cases in 1943 in some States, such as California, Massachusetts, Indiana, Michigan, Wisconsin, and Utah. Also during that year cases were reported in some States which had reported no cases in recent prior years, such as the Dakotas and Nevada. For both 1944 and 1945, cases reported among members of the military are recorded as having contracted the infection outside the United States.

A comparison of the numbers of cases of malaria reported by the State health officers as contracted outside the United States or among members of the Armed Services with the confidential figures furnished by the Office of the Surgeon General of the Army indicates that the State health officers have not been receiving complete reports of such cases or at least have not been reporting them to the Public Health Service. Within the limitations of malaria reporting, the data for indigenous infections as reported in 1944 and 1945 are probably comparable to the figures for prior years. However, consideration should be given to the possible effect on reporting of the withdrawal of large numbers of physicians for duty in the Armed Services, which

may have resulted in proportionately fewer cases of malaria being seen, and therefore reported, by physicians during the war years. Also the reduction and shifts in the civilian population in certain areas during the war should be borne in mind.

If reliance may be placed on the figures furnished by the State health officers, and if we can assume that the degree of completeness of reporting cases of malaria has remained fairly constant, the data indicate that there has been no general increase in indigenous cases in the country as a whole during the war. There has even been an apparent decrease in such cases both in the country as a whole and in the majority of the States. The decline in malaria incidence, beginning in the prewar years, apparently continued through 1944 and 1945. This favorable situation probably reflects the gratifying result of special malaria control activities conducted by the civilian and military authorities in malarious areas.

According to cases reported by the State health officers, the incidence of malaria in the United States has been steadily declining since 1935. The latest cyclic peak of reported malaria cases and deaths occurred during the period 1933–36. In 1932 a total of 68,613 cases was reported in the United States, with 2,540 deaths,[2] but a sharp increase in both malaria morbidity and mortality was recorded in 1933, when 125,549 cases and 4,678 deaths were reported. In 1935 these figures were 137,502 and 4,435, respectively. By 1938 the number of reported cases had dropped to 84,206 and the number of deaths to 2,378. The malaria death rate in the United States declined from 3.7 per 100,000 population in 1933 to 0.5 in 1943. The average of the monthly rates for 1945, based on a 10-percent sampling of death certificates,[3] is approximately 0.4.

The proportion of malaria cases that relapse is not known. It is understood that, in the absence of information to the contrary, it is the policy of the Medical Statistics Division of the Office of the Surgeon General of the Army to record as overseas infections cases occurring within 1 year of the return of the patient from overseas. Public Health Service and other investigators have demonstrated that *Plasmodium vivax* malaria cases contracted by soldiers in foreign countries (South Pacific, Mediterranean, and South American areas), which relapse after the men return to the United States, is infective to species of the native American anopheline mosquitoes, and that these mosquitoes infected by imported *vivax* malaria can transmit the disease by biting a susceptible person.[4] If reliable information can be secured

[2] Figures for deaths are from the Bureau of the Census (death registration States).

[3] Current Mortality Analysis, Bureau of the Census, vol. 3, Nos. 1–12.

[4] Young, Martin D., et al.: Studies on imported malarias. J. National Malaria Soc., 4: 127 (June 1945) Watson, Robert B.: Observations on the transmissibility of strains of *Plasmodium vivax* from Pacific war areas by *Anopheles quadrimaculatus*. Am. J. Trop. Med., 25: 315 (July 1945).

during the current year on the numbers of indigenous cases and relapses of overseas infections it will afford an index to the effect of the thousands of cases of malaria in men returned from overseas, and local distribution will show whether the disease has appeared in formerly malaria-free areas.

CHLORINE AS A POSSIBLE OVICIDE FOR *AEDES AEGYPTI* EGGS[1]

By Stephen P. Hatchett, *Assistant Sanitarian (R), United States Public Health Service*

Roubaud (*1*) found that weak solutions of sodium hypochlorite (1 to 1,000) stimulated hatching of *Aedes aegypti* larvae and then killed them. Viable eggs after being immersed in water for 3 months, when placed in a 1 to 10,000 solution hatched within 1 to 6 days. Concentrated solutions (1 to 100) were found to kill larvae within eggs before the hatching process was initiated. Somewhat similar experiments were performed by the author during February 1945 on the effects of calcium hypochlorite instead of sodium compound on *Aedes aegypti* eggs obtained in Houston, Tex. The calcium hypochlorite used was the commercial preparation known as "HTH," which may be used in the chlorination of drinking water.

The eggs used in these experiments were laid by laboratory-reared females. All eggs were approximately 2 days old before treatment began or before they were dried. Two groups of eggs were used, but all eggs in each group were laid the same evening by females within one rearing cage. All experiments were performed in widemouthed pint jars containing 200 ml. of water, to which various portions of a freshly prepared stock solution of calcium hypochlorite were added in order to obtain definite amounts of available chlorine in each jar. In one series 75 eggs were placed in these solutions immediately after the 48-hour incubation period and were, therefore, continuously wet. In a second series of experiments the eggs were dried for 96 hours after the 48-hour incubation period and then 100 of them were placed in each of the jars containing various concentrations of available chlorine. Controls with tap water were run for both series.

Table 1 gives data obtained from these experiments. It can be seen that eggs kept continuously wet, when placed in solutions containing 500 p. p. m. or more of available chlorine, were all destroyed within 48 hours. All of these eggs were bleached and most were broken. On the other hand, 50 to 100 p. p. m. of free chlorine activated many larvae within their shells, causing them to emerge, whereupon they were killed by the solution. Larvae within eggs in the

[1] From the State Relations Division (Malaria Control in War Areas, Atlanta, Ga.).

solution of 10 p. p. m. of free chlorine were evidently not greatly stimulated, since they were considerably slower to emerge than those in the stronger concentrations, and over two-thirds of them were able to live and develop after hatching.

Somewhat similar results were obtained when dry eggs were immersed in these various solutions of calcium hypochlorite. However, there were some dissimilarities. It took solutions of 5,000 p. p. m. or more of free chlorine to destroy all eggs previously dried so that no hatching occurred. However, some larvae emerged in solutions of 1,000 p. p. m. or less, but all of these died even in solutions as weak as 50 p. p. m. Most of them expired before they had entirely freed themselves from the eggshells. In a solution of 10 p. p. m. of available chlorine only 1 egg failed to hatch, but 74 of the 99 larvae that hatched died. In other words, it took greater concentrations of free chlorine to kill larvae within previously dried eggs than it did for those in continuously wet eggs, but larvae emerging from eggs previously dried were more susceptible to free chlorine than were those from eggs continuously wet.

From these data it appears that newly prepared solutions of calcium hypochlorite containing 50 to 100 p. p. m. of available chlorine are effective ovicides for both continuously wet and previously dried *Aedes aegypti* eggs. Although water treated with such quantities of chlorine would not be suitable for drinking even after a considerable period of time, this treatment might have useful application for fire-protection barrels or buckets, water stored in barrels to keep them, from shrinking, and similar instances where water is stored for pur-

TABLE 1.—*Effects of calcium hypochlorite solutions on* Aedes aegypti *eggs*

	Solutions	Results
Wet eggs, 48 hours old (75 per jar).	0.07 percent calcium hypochlorite 500 p. p. m. available Cl_2.	After 48 hours all eggs bleached, most broken. None ever hatched.
	0.014 percent calcium hypochlorite 100 p. p. m. available Cl_2.	After 48 hours 70 larvae had emerged but all died. 5 eggs bleached and never hatched.
	0.007 percent calcium hypochlorite 50 p. p. m. available Cl_2.	After 96 hours 9 larvae hatched but all died. 66 eggs with dead larvae protruding.
	0.0014 percent calcium hypochlorite 10 p. p. m. available Cl_2.	After 144 hours 67 larvae hatched of which only 15 died. 8 eggs never hatched.
	Control (tap water)	74 larvae hatched, last one after 7 days.
Dry eggs, dried 96 hours after 48 hours old (100 per jar).	0.7 percent calcium hypochlorite 5,000 p. p. m. available Cl_2.	After 48 hours all eggs bleached, most broken. None ever hatched.
	0.14 percent calcium hypochlorite 1,000 p. p. m. available Cl_2.	After 48 hours 4 free dead larvae, 12 dead larvae protruding from eggs, 84 bleached, broken eggs.
	0.07 percent calcium hypochlorite 500 p. p. m. available Cl_2.	After 48 hours 7 free dead larvae, 93 dead larvae protruding from eggs.
	0.014 percent calcium hypochlorite 100 p. p. m. available Cl_2.	After 48 hours 13 free dead larvae, 87 dead larvae protruding from eggs.
	0.007 percent calcium hypochlorite 50 p. p. m. available Cl_2.	After 86 hours 8 free dead larvae, 64 dead larvae protruding from eggs, 18 bleached eggs.
	0.0014 percent calcium hypochlorite 10 p. p. m. available Cl_2.	After 168 hours 25 live larvae, 74 dead larvae, and 1 unhatched egg.
	Control (tap water)	After 168 hours 91 live larvae, 9 unhatched eggs.

poses other than drinking. It might also be applied before dumping and replacing drinking water in barrels breeding mosquitoes, to induce the eggs on the sides of the container to hatch and then be destroyed.

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AEDES TORTILIS (THEOBALD), A MOSQUITO NEW TO THE UNITED STATES [1]

By Arthur E. Staebler, *Passed Assistant Sanitarian (R)*, and William F. Buren, *Assistant Sanitarian (R), United States Public Health Service*

Aedes tortilis (Theobald) occurs in the Bahamas, Virgin Islands, and the Greater Antilles. So far as we are aware the species has never before been taken in the United States, even on the Florida Keys. On August 28, 1945, a female specimen was captured in a light trap operated by Mr. J. H. Hause, Malaria Control in War Areas, at Key West, Fla. As Key West is a port of entry for aircraft, this trap was set up by the writers with the cooperation of Mr. Hause for the purpose of checking on the possible implantation of exotic insects of public health interest.

Aedes tortilis has also been taken in the routine insect inspections of aircraft from quarantinable areas, a dead female having been found on a plane arriving at Miami, Fla., on August 20, 1945, from San Juan, Puerto Rico, via Ciudad Trujillo, Dominican Republic; Port au Prince, Haiti; and Camaguey, Cuba.

There is a possibility that *Aedes tortilis* may have been recently introduced at Key West by aircraft.

The identification of the specimens has been confirmed by Dr. Alan Stone of the United States National Museum.

[1] From the Foreign Quarantine Division.

DEATHS DURING WEEK ENDED APR. 13, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 13, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	9,105	9,154
Average for 3 prior years	9,528	
Total deaths, first 15 weeks of year	150,718	144,518
Deaths under 1 year of age	594	599
Average for 3 prior years	644	
Deaths under 1 year of age, first 15 weeks of year	9,077	9,554
Data from industrial insurance companies:		
Policies in force	67,201,289	67,218,382
Number of death claims	13,322	14,293
Death claims per 1,000 policies in force, annual rate	10.3	11.1
Death claims per 1,000 policies, first 15 weeks of year, annual rate	11.2	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 20, 1946

Summary

Of the 9 cases of smallpox reported for the current week, 4 occurred in the State of Washington. For the country as a whole, 158 cases have been reported for the year to date, as compared with 172 for the corresponding period last year and a 5-year median of 362. (See p. 692.)

The incidence of measles declined during the week in all of the 9 geographic areas except the West North Central and the Mountain. A total of 37,960 cases was reported, as compared with 40,746 last week and 25,362 for the median of the corresponding weeks of the past 5 years. Of the current total, 21,537 cases, or about 57 percent, occurred in the Middle Atlantic and East North Central areas, where approximately the same percentage occurred last week. The cumulative figure is 339,156, as compared with 398,809 for the corresponding period in 1944 and a 5-year median of 288,308.

A total of 296 cases of diphtheria was reported, as compared with 337 last week and a 5-year median of 201. The total to date, 5,864, is more than reported for the corresponding period of any year since 1939.

Of the total of 29 cases of poliomyelitis, the same number as reported last week, Florida and California reported 6 each, New York 5, and Washington 3. For the corresponding week last year, 32 cases were reported. The 5-year median for the week is 23. Since March 16, the week of lowest incidence so far this year, 138 cases have been reported, as compared with 156 and 94, respectively, for the corresponding periods of 1945 and 1944.

A total of 112 cases of meningococcus meningitis was reported, as compared with 131 last week and a 5-year median of 190. The cumulative total is 2,949, as compared with a 5-year median for the period of 3,807 (a high figure due to the high incidence in 1943, 1944, and 1945).

For the current week, a total of 9,028 deaths was recorded in 93 large cities of the United States, as compared with 9,105 last week, 9,109 and 9,288, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,274. The cumulative figure for the year is 159,746, as compared with 153,627 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Apr. 20, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Apr. 20, 1946	Apr. 21, 1945		Apr. 20, 1946	Apr. 21, 1945		Apr. 20, 1946	Apr. 21, 1945		Apr. 20, 1946	Apr. 21, 1945	
NEW ENGLAND												
Maine	1	0	1	-------	-------	-------	64	-------	135	0	0	3
New Hampshire	0	0	0	-------	-------	-------	78	-------	23	1	0	0
Vermont	0	0	0	-------	-------	-------	3	8	118	1	0	0
Massachusetts	3	2	2	-------	-------	-------	1,607	118	817	3	2	7
Rhode Island	0	0	1	-------	39	1	9	7	24	0	0	0
Connecticut	3	2	1	-------	3	2	283	169	447	3	1	2
MIDDLE ATLANTIC												
New York	25	21	18	(1)	(1)	[1] 6	5,386	158	2,314	10	32	32
New Jersey	13	7	5	3	3	7	3,466	58	1,545	3	2	5
Pennsylvania	26	8	8	-------	1	1	4,225	277	1,419	14	11	11
EAST NORTH CENTRAL												
Ohio	17	8	7	1	8	10	754	54	1,084	5	6	6
Indiana	4	6	6	4	2	7	563	34	256	1	2	2
Illinois	5	4	11	1	2	9	808	151	1,139	6	11	11
Michigan [2]	8	7	6	2	2	3	1,769	161	944	5	6	6
Wisconsin	1	1	1	57	32	37	4,566	48	1,620	4	1	2
WEST NORTH CENTRAL												
Minnesota	13	4	2	-------	4	1	30	13	285	0	1	1
Iowa	3	8	3		-------	5	205	39	290	1	2	1
Missouri	7	2	2	2	5	4	331	11	415	6	9	9
North Dakota	1	1	1	-------	7	7	9	3	70	0	0	0
South Dakota	1	0	0	-------	-------	-------	24	19	15	1	0	0
Nebraska	1	2	3	-------	2	2	376	28	198	0	1	1
Kansas	0	5	3	-------	4	4	700	35	576	1	0	1
SOUTH ATLANTIC												
Delaware	0	0	0	-------	-------	-------	66	1	15	0	1	0
Maryland [2]	22	9	6	4	1	3	499	52	378	2	5	5
District of Columbia	3	1	1	-------	-------	3	269	12	112	1	3	2
Virginia	5	6	6	159	149	217	430	78	425	8	6	6
West Virginia	9	2	2	5	3	13	67	32	246	1	2	2
North Carolina	7	6	6	-------	-------	6	498	82	864	1	4	4
South Carolina	3	0	3	229	140	288	341	18	372	0	0	1
Georgia	0	4	5	1	7	47	160	34	201	0	7	2
Florida	9	8	2	2	-------	9	179	28	171	0	5	5
EAST SOUTH CENTRAL												
Kentucky	4	1	3	9	3	16	227	6	198	5	2	2
Tennessee	7	2	3	17	46	46	238	175	219	3	12	12
Alabama	2	9	5	18	20	114	266	17	288	1	1	8
Mississippi [2]	3	5	5	-------		-------	-------	-------	-------	1	3	3
WEST SOUTH CENTRAL												
Arkansas	8	5	4	33	30	70	178	49	183	1	1	1
Louisiana	9	6	2	4	2	2	51	37	116	3	4	4
Oklahoma	2	2	3	24	52	52	483	86	106	2	3	1
Texas	32	28	27	595	756	562	2,005	490	1,160	2	9	5
MOUNTAIN												
Montana	0	1	1	1	9	2	64	13	132	0	0	0
Idaho	1	0	0	22	1	1	121	2	62	1	0	0
Wyoming	0	0	0	-------	-------	-------	102	6	74	0	0	0
Colorado	8	13	7	6	3	26	1,318	21	511	1	1	1
New Mexico	1	5	2	2	2	2	71	14	99	0	0	0
Arizona	5	1	2	40	56	68	236	17	104	0	0	0
Utah [2]	0	0	0	1	1	10	465	319	228	0	0	0
Nevada	0	0	0	-------	-------	-------	10	1	1	0	0	0
PACIFIC												
Washington	2	12	1	-------	3	2	615	468	377	1	5	5
Oregon	4	1	2	23	8	17	371	85	165	2	1	1
California	18	28	18	46	12	78	3,374	1,139	1,139	11	28	23
Total	296	243	201	1,311	1,418	2,143	37,960	4,673	25,362	112	190	190
16 weeks	5,864	4,721	4,589	180,632	56,076	69,295	330,156	45,052	288,308	2,949	3,807	3,807

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Apr. 20, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis, Week ended— Apr. 20, 1946	Poliomyelitis, Week ended— Apr. 21, 1945	Poliomyelitis, Median 1941–45	Scarlet fever, Week ended— Apr. 20, 1946	Scarlet fever, Week ended— Apr. 21, 1945	Scarlet fever, Median 1941–45	Smallpox, Week ended— Apr. 20, 1946	Smallpox, Week ended— Apr. 21, 1945	Smallpox, Median 1941–45	Typhoid and paratyphoid fever [3], Week ended— Apr. 20, 1946	Typhoid and paratyphoid fever [3], Week ended— Apr. 21, 1945	Typhoid and paratyphoid fever [3], Median 1941–45
NEW ENGLAND												
Maine	0	0	0	36	39	29	0	0	0	1	1	1
New Hampshire	0	0	0	19	3	10	0	0	0	0	0	0
Vermont	0	0	0	12	29	12	0	0	0	0	0	0
Massachusetts	0	0	0	157	299	386	0	0	0	1	2	2
Rhode Island	0	0	0	12	30	25	0	0	0	0	1	0
Connecticut	0	0	0	47	72	75	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	5	6	1	855	797	569	0	0	0	4	3	5
New Jersey	0	0	0	147	134	148	0	0	0	1	1	1
Pennsylvania	0	0	0	519	514	514	0	0	0	2	6	8
EAST NORTH CENTRAL												
Ohio	2	0	0	373	341	281	0	0	0	0	2	2
Indiana	0	0	0	91	130	130	0	0	0	3	0	0
Illinois	1	1	0	172	313	313	0	0	0	2	3	3
Michigan [2]	0	2	0	202	297	297	0	1	0	4	2	2
Wisconsin	0	1	0	128	176	176	1	2	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	38	97	63	0	0	0	0	0	0
Iowa	1	0	0	56	64	53	0	3	1	2	0	1
Missouri	0	0	0	92	79	116	0	0	0	0	2	2
North Dakota	0	0	0	9	24	18	0	1	0	0	0	0
South Dakota	0	0	0	7	20	20	0	0	0	0	0	0
Nebraska	0	0	0	10	48	36	0	0	0	0	0	0
Kansas	0	0	0	64	65	65	0	0	0	1	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	12	5	8	0	0	0	0	0	0
Maryland [2]	0	0	0	82	170	80	0	0	0	0	2	1
District of Columbia	0	0	0	38	36	20	0	0	0	4	1	0
Virginia	0	0	0	90	90	39	0	0	0	3	1	1
West Virginia	0	0	0	25	50	34	0	0	0	0	3	4
North Carolina	0	0	0	22	52	38	0	0	0	1	0	1
South Carolina	0	0	0	6	6	6	0	0	0	0	2	0
Georgia	0	1	0	12	29	11	0	0	0	3	8	5
Florida	6	2	1	10	8	8	0	0	0	3	2	3
EAST SOUTH CENTRAL												
Kentucky	0	0	1	26	49	71	1	0	0	2	1	1
Tennessee	0	2	0	17	63	63	0	0	0	2	4	4
Alabama	1	2	0	2	12	12	0	0	0	1	3	0
Mississippi [2]	0	2	1	3	15	9	0	0	0	2	1	1
WEST SOUTH CENTRAL												
Arkansas	0	0	0	9	8	4	0	0	0	2	4	1
Louisiana	1	0	0	7	9	8	0	0	0	8	1	4
Oklahoma	0	0	1	16	55	21	2	0	0	2	1	1
Texas	2	11	3	58	91	71	1	0	1	14	7	6
MOUNTAIN												
Montana	0	0	0	8	19	19	0	0	0	0	1	0
Idaho	0	0	0	3	28	28	0	0	0	0	0	0
Wyoming	0	0	0	5	11	11	0	0	0	0	1	0
Colorado	1	0	0	49	71	52	0	1	0	0	1	0
New Mexico	0	0	0	1	32	9	0	0	0	0	2	1
Arizona	0	0	0	10	52	10	0	0	0	0	0	0
Utah [2]	0	0	0	28	33	30	0	0	0	0	0	0
Nevada	0	0	0	0	1	0	0	0	0	0	0	0
PACIFIC												
Washington	3	0	0	28	137	35	4	0	0	2	0	0
Oregon	0	0	0	40	35	24	0	0	2	3	0	0
California	6	2	2	180	414	118	0	4	0	3	0	2
Total	29	32	23	3,833	5,155	4,031	9	12	19	76	70	73
16 weeks	604	553	384	56,296	89,046	63,798	158	172	362	759	904	1,146

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 1; Illinois 1; Florida 2; Texas 3; Oregon 1; California 1.

Telegraphic morbidity reports from State health officers for the week ended Apr. 20, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Apr. 20, 1946	Whooping cough: Week ended— Apr. 21, 1945	Whooping cough: Median 1941–45	Week ended Apr. 20, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	32	32	25								2
New Hampshire	2	18	11								
Vermont	11	37	22								2
Massachusetts	78	85	114		3						2
Rhode Island	34	14	14								
Connecticut	71	38	38	2							1
MIDDLE ATLANTIC											
New York	161	242	242	6	9		2				6
New Jersey	91	128	117			2					2
Pennsylvania	104	190	231								4
EAST NORTH CENTRAL											
Ohio	67	171	148								1
Indiana	21	9	45	1							1
Illinois	68	41	84	8	1		2		1		12
Michigan [3]	89	71	215								6
Wisconsin	80	81	100				1				10
WEST NORTH CENTRAL											
Minnesota	8	7	40	1							5
Iowa	16	4	25								
Missouri	9	19	19			1					1
North Dakota	1	1	6								1
South Dakota		2	4								
Nebraska		1	6				1				
Kansas	25	30	33				1				10
SOUTH ATLANTIC											
Delaware		3	1								
Maryland [3]	7	81	81			1					2
District of Columbia		9	13								
Virginia	37	59	76			19		1	1		
West Virginia	41	22	26								
North Carolina	67	133	139							2	
South Carolina	61	41	63		11				1	2	
Georgia	6	17	17						1	4	4
Florida	7	13	14				1			3	
EAST SOUTH CENTRAL											
Kentucky	34	22	58			1		1			
Tennessee	18	26	29	1			1				2
Alabama	22	48	35				1			8	4
Mississippi [3]									1	2	
WEST SOUTH CENTRAL											
Arkansas	12	13	13	2					2	1	
Louisiana	1	3	4	1	1				2	5	
Oklahoma	13	30	20								1
Texas	208	240	231	19	240	13				16	17
MOUNTAIN											
Montana	2	6	6								
Idaho	9		3								
Wyoming	3	1	5					2			
Colorado	28	56	56								3
New Mexico	5	12	12			2					
Arizona	28	54	21			21					
Utah [3]	39	32	47						1		
Nevada											
PACIFIC											
Washington	68	19	50								3
Oregon	19	23	21				1				5
California	74	437	354	5	2		1			2	8
Total	1,837	2,621	3,749	46	267	60	12	4	10	45	115
Same week, 1945	2,621			25	319	104	4	2	8	33	83
Average, 1943–45	2,771			30	251	76	10	[4] 8	11	[4] 33	
16 weeks: 1946	28,938			608	4,519	1,607	131	14	304	737	1,249
1945	39,248			442	7,102	1,875	110	8	275	760	1,370
Average, 1943–45	44,115		[4] 61,495	447	4,522	1,209	151	[4] 15	236	[4] 606	

[3] Period ended earlier than Saturday.

[4] 5-year median, 1941–45.

Anthrax: New York 1 case.

Dengue fever: Maryland 1 case, contracted outside the U. S. A.

Leprosy: Louisiana 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 13, 1946

This table lists the reports from 90 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	-------	0	2	0	2	0	0	6
New Hampshire:												
Concord	0	0	-----	0	-------	0	1	0	0	0	0	------
Vermont:												
Barre	0	0	-----	0	1	0	1	0	2	0	0	------
Massachusetts:												
Boston	0	0	------	0	475	2	14	0	52	0	0	22
Fall River	0	0	------	0	43	1	0	0	5	0	0	5
Springfield	0	0	------	0	31	0	0	0	4	0	1	------
Worcester	0	0	-----	0	165	0	6	0	11	0	0	17
Rhode Island:												
Providence	0	0	1	0	12	0	3	0	3	0	0	17
Connecticut:												
Bridgeport	0	0	------	0	4	0	2	0	3	0	0	2
Hartford	0	0	------	0	3	0	1	0	1	0	1	7
New Haven	0	0	------	0	76	0	2	0	7	0	1	2
MIDDLE ATLANTIC												
New York:												
Buffalo	4	0	------	0	285	0	4	0	8	0	0	5
New York	24	2	1	2	1,532	8	62	1	573	0	0	29
Rochester	0	2	------	0	687	1	2	0	15	0	0	------
Syracuse	0	0	------	0	71	0	2	0	10	0	0	6
New Jersey:												
Camden	3	0	------	0	58	0	3	0	1	0	0	2
Newark	0	0	------	0	1,132	0	8	0	26	0	0	15
Trenton	0	0	1	0	-------	0	0	0	8	0	0	------
Pennsylvania:												
Philadelphia	2	0	2	2	725	4	35	0	55	0	0	29
Pittsburgh	4	0	------	1	-------	2	7	0	36	0	0	5
Reading	0	0	------	0	140	0	1	0	5	0	0	7
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	0	136	1	7	0	15	0	0	4
Cleveland	0	0	1	0	58	0	9	0	54	0	0	19
Columbus	4	0	------	0	7	0	2	0	6	0	0	5
Indiana:												
Fort Wayne	1	0	------	0	1	0	2	0	2	0	0	1
Indianapolis	7	0	------	0	430	1	6	0	16	0	0	29
South Bend	0	0	------	0	2	0	0	0	6	0	0	------
Terre Haute	0	0	------	0	1	1	1	0	3	0	0	------
Illinois:												
Chicago	2	0	1	2	529	7	28	0	98	0	0	38
Springfield	0	0	------	0	6	0	2		0	0		1
Michigan:												
Detroit	5	0	------	0	913	0	8	0	66	0	0	36
Flint	0	0	------	0	1	0	3	0	2	0	0	1
Grand Rapids	0	0	------	0	167	0	1	0	4	0	0	4
Wisconsin:												
Kenosha	1	0	------	0	17	0	0	0	4	0	0	------
Milwaukee	0	0	------	0	2,850	1	9	0	31	0	0	53
Racine	0	0	------	0	38	0	0	0	3	0	0	------
Superior	0	0	------	0	1	0	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	5	0	1	0	5	0	0	2
Minneapolis	5	1	------	0	26	1	1	0	13	0	0	------
St. Paul	0	0	------	0	6	0	2	0	16	0	0	3
Missouri:												
Kansas City	4	0	3	0	30	0	7	0	5	0	0	------
St. Joseph	0	0	------	0	3	0	0	0	1	0	0	------
St. Louis	0	0	1	0	110	3	12	0	15	0	0	------

City reports for week ended Apr. 13, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0		0		0	1	0	0	0	0	
Nebraska:												
Omaha	0	0		0	57	0	2	0	6	0	0	
Kansas:												
Topeka	0	0		0	13	0	1	0	18	0	0	4
Wichita	0	0		0	70	0	3	0	1	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0		0	19	1	3	0	1	0	0	
Maryland:												
Baltimore	6	0		0	408	1	7	0	26	0	0	10
Cumberland	0	0		0	1	0	0	0	5	0	0	
Frederick	0	0		0		0	0	0	0	0	0	
District of Columbia:												
Washington	0	0	1	1	212	0	6	0	24	0	1	4
Virginia:												
Lynchburg	0	0		0	11	0	0	0	2	0	0	
Richmond	0	0	14	0	55	0	3	0	8	0	0	
Roanoke	0	0		0	9	0	0	0	4	0	0	
West Virginia:												
Charleston	0	0		0		0	0	0	0	0	0	
Wheeling	4	0		0	2	0	3	0	0	0	0	12
North Carolina:												
Raleigh	0	0		0	84	0	3	0	0	0	0	3
Wilmington	0	0		0	29	0	1	0	0	0	0	1
Winston-Salem	0	0		0	20	0	0	0	3	0	0	19
South Carolina:												
Charleston	0	0	2	0	20	0	0	0	2	0	0	3
Georgia:												
Atlanta	0	0		0	23	0	0	0	4	0	0	
Brunswick	0	0		0	4	0	0	0	0	0	0	
Savannah	0	0		0	1	0	2	0	3	0	0	
Florida:												
Tampa	1	1	1	1	30	0	2	1	3	0	1	
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0		0	33	1	10	0	4	0	0	12
Nashville	0	0		1	10	0	2	0	1	0	1	
Alabama:												
Birmingham	0	0	3	0	18	0	5	0	1	0	0	
Mobile	0	0	3	0	1	0	1	0	1	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	4	0	30	0	2	0	0	0	0	
Louisiana:												
New Orleans	1	0	1	1	13	1	2	2	7	0	0	
Shreveport	2	0		0		0	3	0	0	0	2	
Texas:												
Dallas	3	0		0	54	0	2	0	4	0	0	
Galveston	0	0		0	6	0	1	0	0	0	0	
Houston	3	0		0	10	0	2	0	1	0	0	
San Antonio	0	0	2	2	27	1	6	0	0	0	0	5
MOUNTAIN												
Montana:												
Billings	0	0		0	1	0	1	0	0	0	0	
Great Falls	0	0		0	12	0	1	0	0	0	0	
Helena	0	0		0	3	0	0	0	1	0	0	
Missoula	0	0		0		0	1	1	0	0	0	
Idaho:												
Boise	0	0		0	11	0	0	0	1	0	0	
Colorado:												
Denver	1	0		0	587	0	3	0	14	0	1	27
Pueblo	0	0		0	18	0	1	0	1	0	0	1
Utah:												
Salt Lake City	0	0		0	131	0	2	0	3	0	0	3

City reports for week ended Apr. 13, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	1	97	0	7	0	11	3	0	5
Spokane	0	0	1	0	115	0	3	0	2	0	1	8
Tacoma	0	0	------	0	9	0	0	0	5	0	0	2
California:												
Los Angeles	1	0	8	0	502	2	7	0	52	0	0	10
Sacramento	3	0	------	0	212	0	0	0	0	0	0	1
San Francisco	1	0	7	1	184	1	6	0	25	0	0	1
Total	95	6	58	15	13,929	41	362	5	1,436	3	10	506
Corresponding week, 1945	62	------	42	29	1,061	------	370	------	1,604	1	5	643
Average, 1941-45	63	------	120	[1] 32	[2] 7,050	------	[1] 430	------	1,714	1	12	895

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia 1.
Dysentery, amebic.—Cases: New York 2; Baltimore 1.
Dysentery, bacillary.—Cases: New York 34; Philadelphia 1; Charleston, S. C., 1; Los Angeles 4.
Dysentery, unspecified.—Cases: San Antonio 13.
Tularemia.—Cases: New York 1; Baltimore 1.
Typhus fever, endemic.—Cases: Savannah 1; Little Rock 2; New Orleans 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 90 cities in the preceding table (estimated population, 1943, 34,394,800)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	0.0	0.0	2.6	0.0	2,117	7.8	83.6	0.0	235	0.0	7.8	204
Middle Atlantic	17.1	1.9	1.9	2.3	2,143	6.9	57.4	0.5	341	0.0	0.0	45
East North Central	13.4	0.0	1.2	1.2	3,136	6.7	47.4	0.0	188	0.0	0.0	117
West North Central	17.9	2.0	8.0	0.0	637	8.0	59.7	0.0	159	0.0	0.0	22
South Atlantic	18.0	1.6	29.4	3.3	1,517	3.3	49.0	1.6	139	0.0	3.3	85
East South Central	5.9	0.0	35.4	5.9	366	5.9	106.2	0.0	41	0.0	5.9	71
West South Central	25.8	0.0	20.1	8.6	402	5.7	51.7	5.7	34	0.0	5.7	14
Mountain	7.9	0.0	0.0	0.0	6,060	0.0	71.5	7.9	150	0.0	7.9	246
Pacific	7.9	0.0	25.3	3.2	1,770	4.7	36.4	0.0	150	4.7	1.6	43
Total	14.4	0.0	8.8	2.3	2,117	6.2	55.0	0.8	218	0.5	1.5	77

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

As of April 24, no case of smallpox had been reported in San Francisco since March 27, the date of onset of the last reported local case.

Up to April 20, a total of 42 cases, with 10 deaths, and 1 fatal suspect case had been reported in the Seattle-King County area; 4 cases had been reported outside that area, including 1 case of hemorrhagic type from Everett, with onset on April 14.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—A rat trapped on January 9, 1946, in District 10A, Paauhau area, Honokaa, Hamakua District, Island of Hawaii, T. H., was proved positive for plague on February 25, 1946. Plague infection was also proved positive on February 5, 1946, in a pool of 29 rats trapped on Government Belt Road along the east bank of Keehia Gulch in Hamakua District, Island of Hawaii

Honolulu—Smallpox.—During the week ended March 30, 1946, 1 case of smallpox (off-shipping) was reported in Honolulu, T. H. This is the first case of smallpox reported in the Territory since 1940.

Panama Canal Zone

Notifiable diseases—February 1946.—During the month of February 1946, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	3				4		1		8	
Diphtheria	12	1	2		1		2		17	1
Dysentery:										
Amebic	1						1		2	
Bacillary	1		1		3		1		6	
Malaria [1]	12		2		78		92	4	184	6
Measles							15		15	
Meningitis, meningococcus	2	1	1	1					3	2
Mumps					7		7		14	
Paratyphoid fever	2								2	
Pneumonia		4			24			4	[2] 24	8
Relapsing fever	1								1	
Scarlet fever							4		4	
Tuberculosis		16		2		1		9		28
Typhoid fever							3		3	
Typhus fever	1								1	
Whooping cough					3				[2] 3	

[1] 14 Recurrent cases.
[2] In the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 23, 1946.—During the week ended March 23, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox	-	3	-	77	270	20	23	17	67	477
Diphtheria	-	1	1	16	9	5	1	-	-	33
Dysentery, bacillary	-	-	-	2	-	-	-	-	-	2
Encephalitis, infectious	-	-	-	1	-	-	-	-	-	1
German measles	-	-	-	34	95	-	3	6	21	150
Influenza	-	43	-	-	27	4	-	-	8	82
Measles	-	228	23	690	1,382	3	3	36	18	2,383
Meningitis, meningococcus	-	-	-	4	2	1	1	1	-	9
Mumps	-	2	1	90	272	133	16	77	137	728
Poliomyelitis	-	-	-	-	-	-	-	1	-	1
Scarlet fever	-	6	6	91	53	10	4	11	13	194
Tuberculosis (all forms)	-	5	6	181	60	7	42	9	84	394
Typhoid and paratyphoid fever	-	-	-	9	2	-	1	-	3	15
Undulant fever	-	-	-	3	5	-	-	-	-	8
Venereal diseases:										
Gonorrhea	-	18	26	142	156	37	38	45	92	554
Syphilis	-	5	5	143	75	12	17	4	35	296
Whooping cough	-	1	-	63	63	6	-	5	8	146

FINLAND

Notifiable diseases—February 1946.—During the month of February 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	21	Paratyphoid fever	150
Diphtheria	1,099	Poliomyelitis	13
Dysentery	14	Scarlet fever	265
Gonorrhea	1,310	Syphilis	588
Malaria	2	Typhoid fever	63

JAMAICA

Notifiable diseases—4 weeks ended April 6, 1946.—During the 4 weeks ended April 6, 1946, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1	-	Poliomyelitis	-	1
Chickenpox	1	14	Puerperal sepsis	-	1
Diphtheria	4	6	Scarlet fever	1	-
Dysentery, unspecified	1	6	Tuberculosis	45	66
Erysipelas	-	1	Typhoid fever	15	103
Leprosy	-	2	Typhus fever (murine)	1	1

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during recent months All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Egypt.—During the week ended April 13, 1946, 6 cases of plague were reported in Egypt, including 2 cases reported in Alexandria and 4 cases reported in Ismailiya.

Smallpox

British East Africa—Tanganyika.—For the week ended March 16, 1946, 144 cases of smallpox with 21 deaths were reported in Tanganyika, British East Africa.

Venezuela.—For the month of March 1946, 78 cases of smallpox (alastrim) were reported in Venezuela. States reporting the highest incidence are: Nueva Esparta, 19 cases; Guarico, 15; Sucre, 12.

Typhus Fever

Belgian Congo.—For the week ended March 30, 1946, 69 cases of typhus fever (murine) were reported in the Belgian Congo.

Ecuador.—For the month of March 1946, 87 cases of typhus fever with 4 deaths were reported in Ecuador. Provinces reporting the highest incidence are: Canar, 20 cases; Imbabura, 19; Chimborazo, 12.

Egypt.—For the week ended March 23, 1946, 64 cases of typhus fever were reported in Egypt.

Eritrea.—For the week ended April 6, 1946, 26 cases of typhus fever were reported in Eritrea.

Turkey.—For the week ended April 13, 1946, 66 cases of typhus fever were reported in Turkey, including 2 cases in Icel and 1 case in Istanbul.

Yellow Fever

Bolivia—Santa Cruz Department—San Jose.—During the month of March 1946, 1 fatal case of suspected yellow fever was reported in San Jose, an airport town about 20 miles from San Ignacio, Santa Cruz Department, Bolivia.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

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DIVISION OF PUBLIC HEALTH METHODS

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Public Health Reports

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SHADOWED REPLICAS OF TOOTH SURFACES [1]

By David B. Scott, *Assistant Dental Surgeon* (R), and Ralph W G. Wyckoff, *Senior Scientist* (R), *United States Public Health Service*

Present-day laboratory methods in dental histology and histopathology do not include adequate means for studying the topographical surface of the enamel, its microstructure *in situ*, and especially the minute characteristics of the surfaces of teeth under various conditions in the mouth. The preparation of metal-shadowed collodion replicas makes such investigation possible. This technique provides a means of attack on such important dental problems as: (*a*) The characteristics of normal tooth surfaces, (*b*) the initiation and gradual development of caries, (*c*) the manner in which chemical agents, such as acids and fluorides, hasten or retard tooth disintegration, and (*d*) the effects of dentifrices and abrasives on enamel surfaces.

This work was originally planned as a study of ultrafine structures which might be revealed with the electron microscope. It was soon apparent, however, that there was first much to be learned about the coarse surface details best investigated at lower magnifications. The present paper is a brief description of the technique used to make shadowed replicas of tooth surfaces for examination with the optical microscope, with reproductions of several typical structures thus revealed. Subsequent articles will be devoted to applications to specific problems in dentistry.

Most information about the surface structure of teeth has previously been obtained through the microscopic examination of cross and longitudinal ground sections. There have also been published a few photomicrographs (*1*) obtained with a reflection-type microscope and several electron micrographs (*2*), (*3*), (*4*) of polystyrene-silica (*5*), (*6*) replicas. Since ground sections must be prepared from extracted teeth and since polystyrene impressions must be taken under high pressure and at elevated temperatures, neither method is adaptable to the study of teeth *in situ*.

[1] From the Division of Physiology and Industrial Hygiene Research Laboratory, National Institute of Health.

Satisfactory collodion replicas of tooth surfaces can be made by the following procedure, which is essentially the same whether the replica is to be made from an extracted tooth or from one in the mouth. First the surface is cleaned or treated to the extent desired and then completely dried. A thin film of 2-percent collodion, prepared by diluting 4-percent collodion, U. S. P., with a mixture of equal parts of ether and amyl acetate, is applied to the dry surface with a ball-ended glass rod. After about 15 minutes' allowance for this film to set and dry, a drop of water is placed with a micro pipette at its most accessible edge. The wet edge is gently lifted with a thin knife blade until the film can be grasped with a small pair of pickup tweezers. The replica is then carefully stripped from the tooth. Tooth surfaces are curved, not flat over an appreciable area, and this enhances the natural tendency of these collodion films to curl up when drying. In order to obtain a sufficiently flat replica for subsequent photography the freshly stripped film is placed face up in a drop of water on a clean microscope slide and then spread and flattened with two small pointed manipulators. It has been found convenient to arrange several replicas in this fashion on the same slide. A cover glass is fixed in place over the flattened replicas with cellulose tape. Drying is then allowed to proceed for at least 8 hours at room temperature.

Thoroughly dried replicas are shadowed by oblique metal evaporation under a high vacuum, according to the procedures already described (*7*), (*8*). Silver, and occasionally aluminum, has been used in this work as evaporated metal. The angle of shadowing is such that shadows cast are twice as long as the heights of the details causing them. For shadowing, the protective cover glasses are removed, leaving the replicas undisturbed on their slides. After metal coating, cover glasses with liquid cement applied only to the edges are fixed in place over the finished replicas.

The nature of the information about tooth surfaces which is given by shadowed replicas is best illustrated through a series of typical photographs. To make these pictures, photomicrographic negatives of the mounted replicas were prepared, using achromats and either a 5× or a 10× eyepiece. Since it has been found easier to interpret shadowed micrographs printed as negatives, so that the "shadows" are dark and thus correspond to the normal visual experience when light is the illuminant, intermediate contact positives were made on lantern slides from the original negatives. The final negatives were projection prints from these lantern slide positives.

Figure 1 shows the type of replica commonly obtained from the undamaged enamel of a normal tooth, whether in the mouth or after extraction. The particular area reproduced here is from the labial surface of an extracted upper left lateral. Except for the numerous scratches running in various directions, and appearing as ridges in

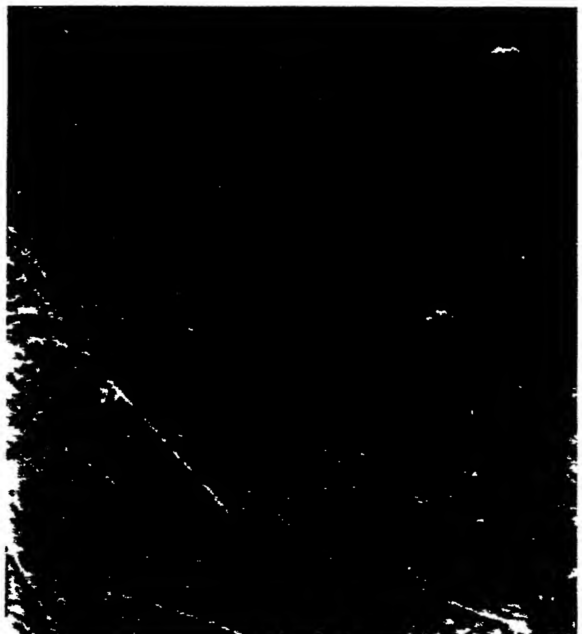

FIGURE 1 —Structureless enamel surface 435 ×

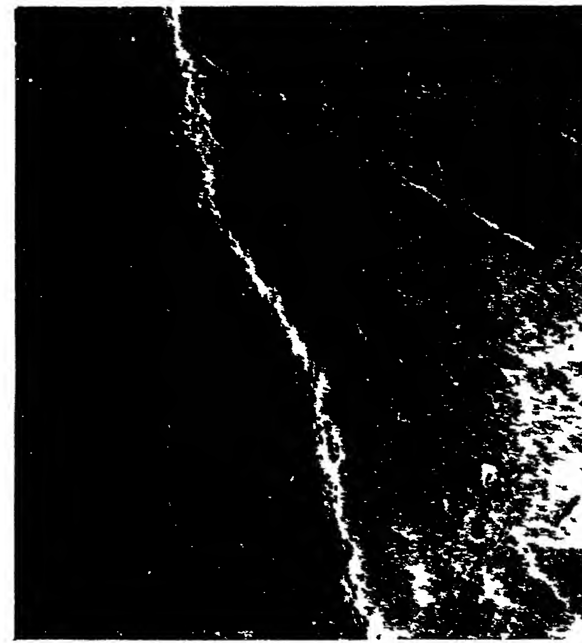

FIGURE 2 —Crack in enamel surface 400 ×

FIGURE 3.—Crack in enamel surface, 435×.

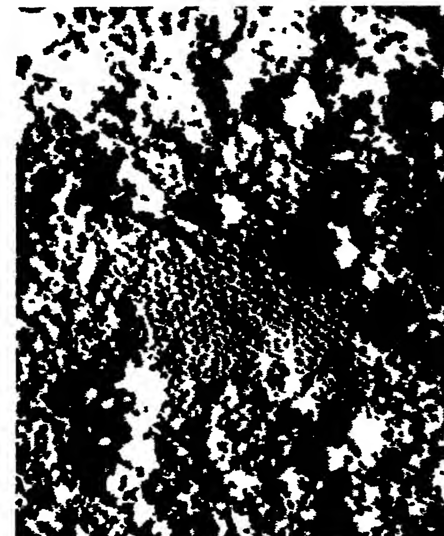

FIGURE 4.—Deep artificial etch, revealing underlying prismatic structure, 220×

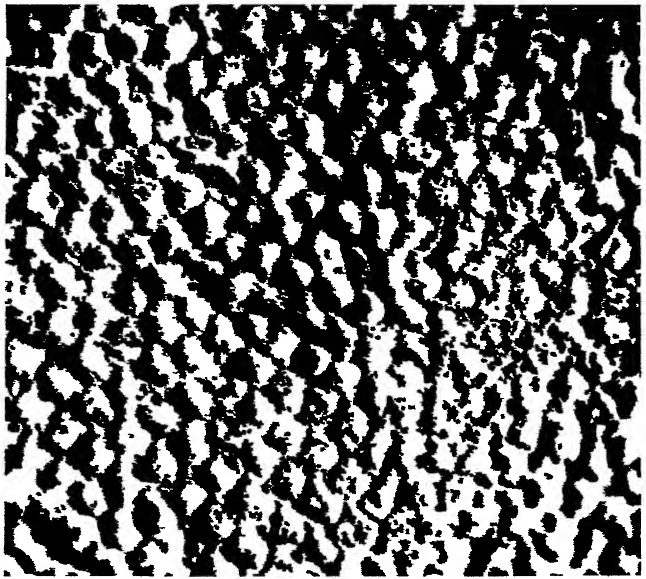

FIGURE 5 —Deep artificial etch revealing underlying prismatic structure, 560×

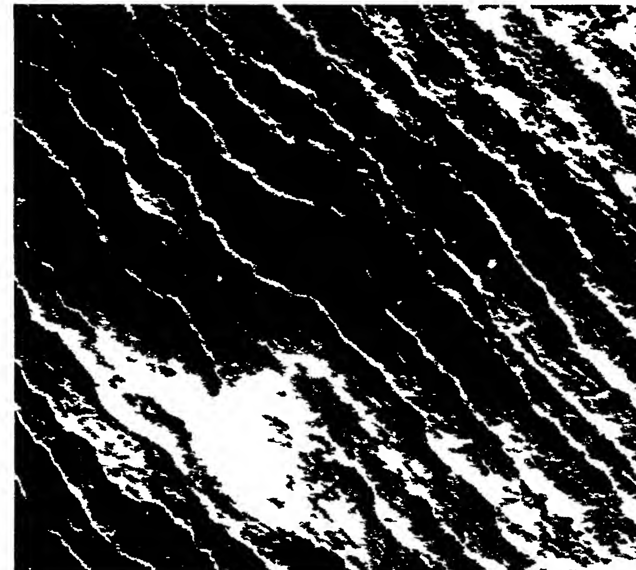

FIGURE 6 —Enamel surface showing perikymata 105×

PLATE IV

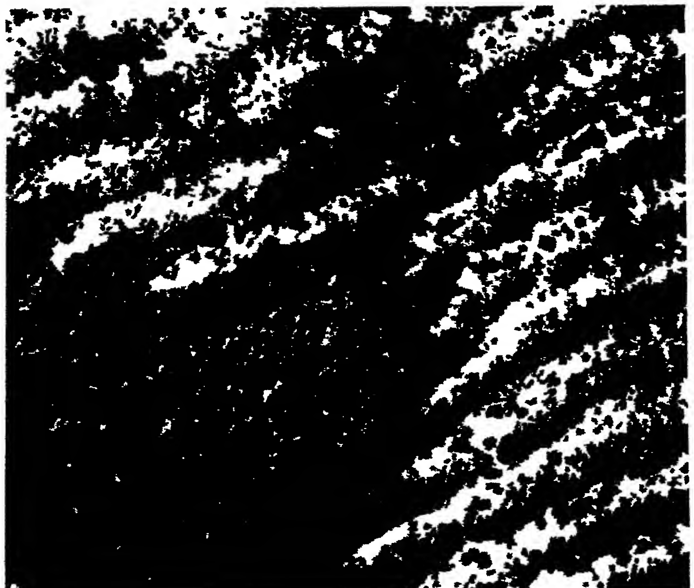

FIGURE 7.—White spot near contact point, 105×

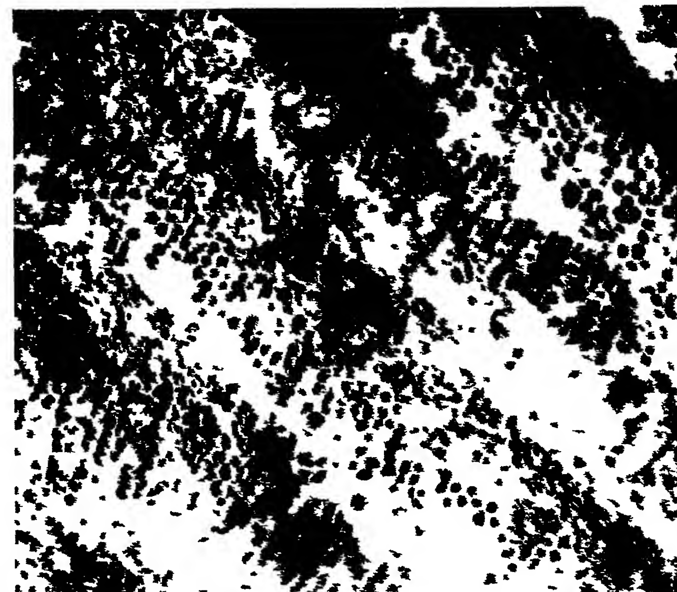

FIGURE 8.—White spot below contact point 255×

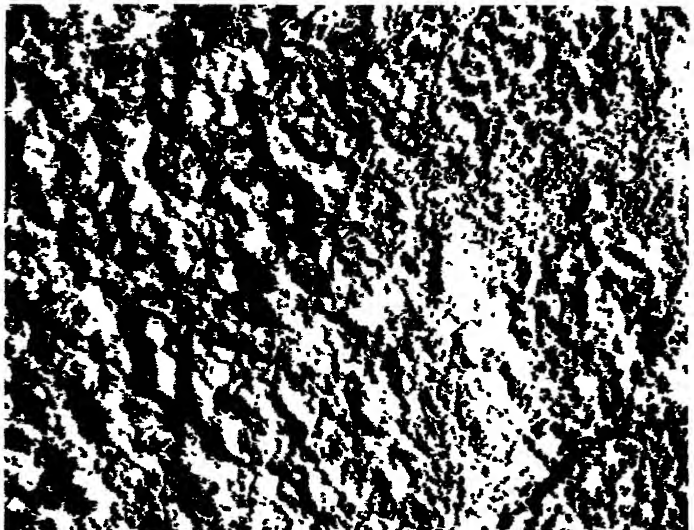

FIGURE 9.—Heavily discolored opaque area, 130×.

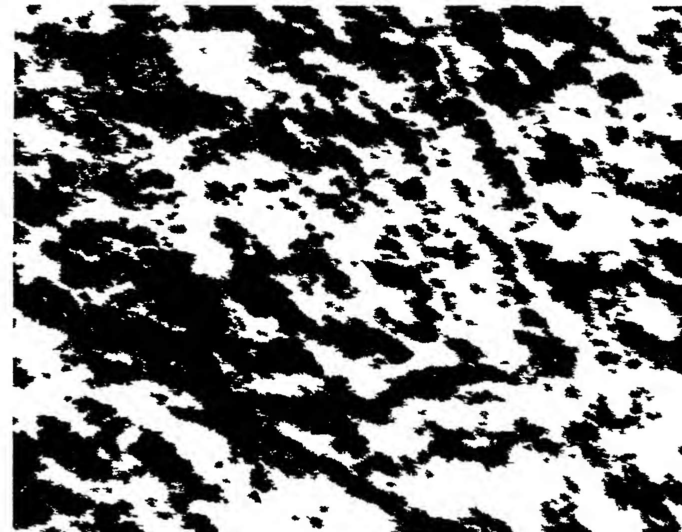

FIGURE 10.—Enamel rod pattern on surface having minute white areas, 1,500×.

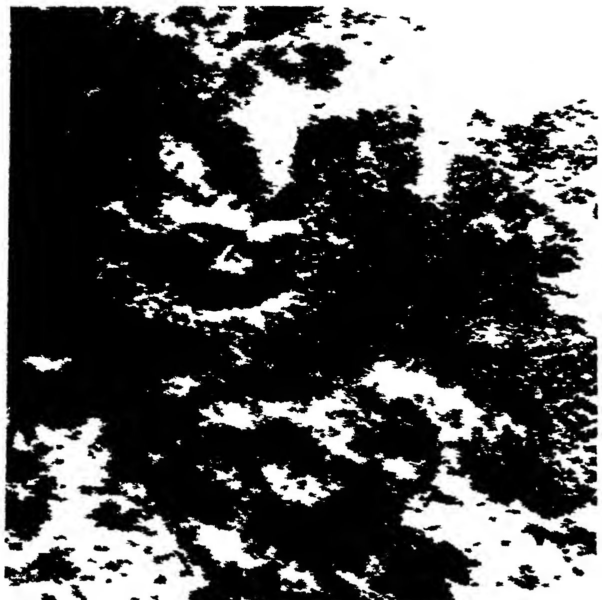

FIGURE 11.—Small pit in opaque white surface, 150×

FIGURE 12.—Discrete pits in severely fluorosed enamel 50×

the replica, the surface is remarkably smooth with little or no indication of the prismatic structure of the underlying enamel

A fine crack in the labial surface of an extracted upper right cuspid is reproduced in figure 2. The surface of this tooth was on the whole intact and featureless. The replica of figure 3 was taken from the labial surface of a badly cracked upper right central of one of the workers in the laboratory. The deep fissure, the fine detail in the rough areas on either side of it, and the structureless regions beyond are clearly evident.

Figures 4 and 5 are photomicrographs of replicas taken from surfaces of extracted teeth after they had been deeply etched for 2 minutes with concentrated hydrochloric acid to reveal the underlying prismatic structure of the enamel. Figure 4 shows this prismatic structure over a considerable area of the labial surface of an upper left cuspid. It is interesting to note that even though the entire crown of the tooth was immersed in the acid the decalcification was not uniform. The prismatic structure appears at a higher magnification and in greater detail in figure 5; this replica was taken from the buccal surface of a lower first molar. Succeeding photomicrographs exhibit a variety of stages between the smooth structureless surfaces of the first pictures and these well-defined prismatic patterns.

The replica of figure 6 was taken from the mesial surface of an upper right first bicuspid immediately below the contact point. Although there was no break in the surface detectable with an explorer, the tooth showed a white area originating at the gingival margin of the contact point. Most of the reproduced area is of normal structureless enamel, but the edge of the white spot appears in the extreme right portion of the picture, and it exhibits faintly the fine structure which is so apparent in the etched surfaces. The stratification of the entire surface, which apparently corresponds to the perikymata, is well defined in this picture and in many others.

A more seriously damaged region adjacent to a contact point is illustrated in figure 7. This region, from the distal (bordering on the buccal) surface of a lower right second bicuspid, was opaque white with a central brownish spot, and had no surface breaks detectable with an explorer. A high magnification of the replica from a small white spot occurring just below the contact point on the distal surface of an upper right second bicuspid is reproduced in figure 8.

When regions of heavy discoloration are associated with opacities on tooth surfaces they often yield replicas resembling figure 9, obtained from the distal surface of an upper left central. Although there may not be signs of deep pitting, the detail on these rough areas is readily disturbed by probing instruments, and it is often difficult to be sure whether they represent surface deposits or areas of disintegration of the superficial layers of enamel.

A photograph at high magnification of a surface which showed

minute areas of opacity is shown in figure 10. The ends of the enamel rods and the inter-rod material are clearly visible. This replica was taken from the labial surface of an upper left lateral.

The remaining two photographs show replicas taken from surfaces having visible breaks immediately perceptible with an explorer. Figure 11 is from the buccal surface of an upper right second molar. The entire surface was covered with dull, white opaque areas indicative of either hypocalcification or decalcification, together with numerous pits, several of the larger of which showed the recognized initial stages of caries. The photomicrograph includes one of the smaller of these pits surrounded by an opaque-white region. The surface of a severely fluorosed tooth is pictured in figure 12. This specimen came from a natural fluoride area where the communal water supply contains 3.9 p. p. m. of fluorine. The tooth, a lower left first molar, had a dull, opaque, chalky-white appearance; the buccal surface, represented in part by the replica, had nine discrete pits from 0.5 to 1.0 mm. in diameter. Three of these pits are shown in the photograph, which is not a photomicrograph but a direct enlargement of the replica made on the photoprinter.

SUMMARY

Metal-shadowed collodion replicas can be prepared which reveal the microstructure of the surfaces of teeth *in situ* as well as of extracted teeth. Typical micrographs are presented which show the appearance under the optical microscope of the surfaces of unbroken and of severely etched enamel, of areas of disintegration and probable incipient caries, and of pits caused by excessive amounts of fluorine in drinking water. This experimental technique thus offers a new means of approaching such important dental problems as the changes in tooth surfaces (associated with dental caries attack), and the alteration in structure resulting from the administration of different amounts of fluorine.

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THE PREPARATION OF ANTIGENS FROM YOLK SACS INFECTED WITH RICKETTSIAE [1]

By Norman H. Topping, *Senior Surgeon*, and Charles C. Shepard, *Passed Assistant Surgeon, United States Public Health Service*

The preparation of antigens from the yolk sacs of eggs infected with the rickettsial agents has proved somewhat difficult. Use by Craigie (*1*) of diethyl ether as a lipoid solvent as well as a means of selectively removing tissue impurities was a definite advance in the preparation of rickettsial antigens from infected yolk sacs. The demonstration of a soluble antigen released from *Rickettsia prowazeki* when exposed to diethyl ether by Topping and Shear (*2*) added an active fraction that could be extracted from ether-processed yolk sacs. However, it has been found that no single procedure is applicable to all of the various rickettsial agents, therefore several modifications of the original techniques are necessary when working with different agents. For example, a soluble antigen is released by diethyl ether from both murine and epidemic typhus and from Rocky Mountain spotted fever but not from the rickettsiae of Q fever. The usual ether-extraction method fails to release a soluble antigen from both Q fever and tsutsugamushi rickettsiae, yet the method used for the preparation of Q fever antigens is not applicable to tsutsugamushi. It is the purpose of this paper to outline briefly three basic methods for the preparation of rickettsial antigens and to present the results of the three methods when applied to five of the rickettsiae.

MATERIALS

Yolk sacs showing good growth of rickettsiae when suitably stained and examined microscopically were pooled in 500-cc. centrifuge bottles and stored at —45° C. When the accumulated yolk sacs in the pools totaled 100 gm. or more they were thawed and transferred to a Waring Blendor. They were ground without the addition of any liquid with precautions against heating of the blender cup. The homogeneous mass was then divided by weight into suitable containers for further processing.

The Breinl strain of epidemic typhus, the Wilmington strain of murine typhus, the Bitter Root strain of Rocky Mountain spotted fever, the Karp strain of tsutsugamushi disease, and an Australian strain of Q fever were used throughout the studies. Homologous antiserums were used in the complement-fixation tests (*3*) for the measurement of the antigenicity of the various fractions. The serums were from guinea pigs which had been infected with guinea pig-passage virus and had never received yolk-sac material.

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[1] From the Division of Infectious Diseases, National Institute of Health

METHODS

Three methods of preparing antigens from infected yolk sacs have been developed. Although they all use diethyl ether in processing the crude material they operate in different ways, and the results differ with the various strains of rickettsiae. The steps taken in the three methods are briefly outlined in the accompanying flow chart (fig. 1). It will be seen that the homogeneous mass which results from thorough grinding in a blender can either be made into a 10-percent emulsion with saline (which may or may not contain formalin), or it may be defatted immediately. If a 10-percent emulsion is made it may be processed in two ways as outlined under methods 1 and 2.

Method 1.—After an adjustment in pH, the emulsion is shaken directly with 1½ volumes of diethyl ether (*4*). The emulsion soon breaks into three distinct phases—a clear yellow ether at the top; an interphase of extraneous material containing some rickettsiae; and the aqueous phase which, with some of the strains, contains most of the rickettsiae plus the soluble antigen released from the rickettsiae by exposure to the ether. If it is desired to separate the rickettsiae from the soluble antigen, this can be done by centrifugation of the aqueous phase.

Method 2.—A preliminary centrifugation is employed to sediment the rickettsiae before diethyl ether is used (*5*). This method allows for the early discard of much of the pigment and soluble proteins of the yolk sacs as well as for concentration of the rickettsiae. The sedimented rickettsiae may be resuspended in any desired volume of saline; one-tenth the original volume for resuspension is used routinely. Again, after shaking with ether, three distinct phases appear; sometimes this separation occurs rather slowly. Another centrifugation may be utilized to separate the rickettsiae of the aqueous phase from any soluble antigen that may have been released by the ether.

Method 3.[2]—Diethyl ether is used in a manner different from the two previous methods described. The ground yolk sacs are placed in 500-cc. centrifuge bottles, and 10 volumes of cold ether is added. The mixture is thoroughly shaken in the cold (4° C.) for 30 minutes to 1 hour. The ether becomes very yellow and on standing a few moments a reddish mass of tissue falls to the bottom of the bottle. The ether is decanted as completely as possible and the tissue washed with cold ether until no yellow color is visible in the ether. Usually once or twice is sufficient. Approximately 1 cc. of sterile distilled water is added for each gram of yolk sac, and the mixture is thoroughly shaken. The ether in solution is removed under a partial vacuum and the tissue suspension allowed to stand overnight in the refrigerator. The next morning it is centrifuged at about 3,000 r. p. m. for

[2] Method 3 is a modification of a method previously described in a paper entitled "A method for the preparation of tsutsugamushi (scrub typhus) antigen from infected yolk sacs." *By* Norman H. Topping and Charles C. Shepard. Pub. Health Rep. (In press.)

DIETHYL ETHER TREATMENT OF YOLK-SAC MATERIAL

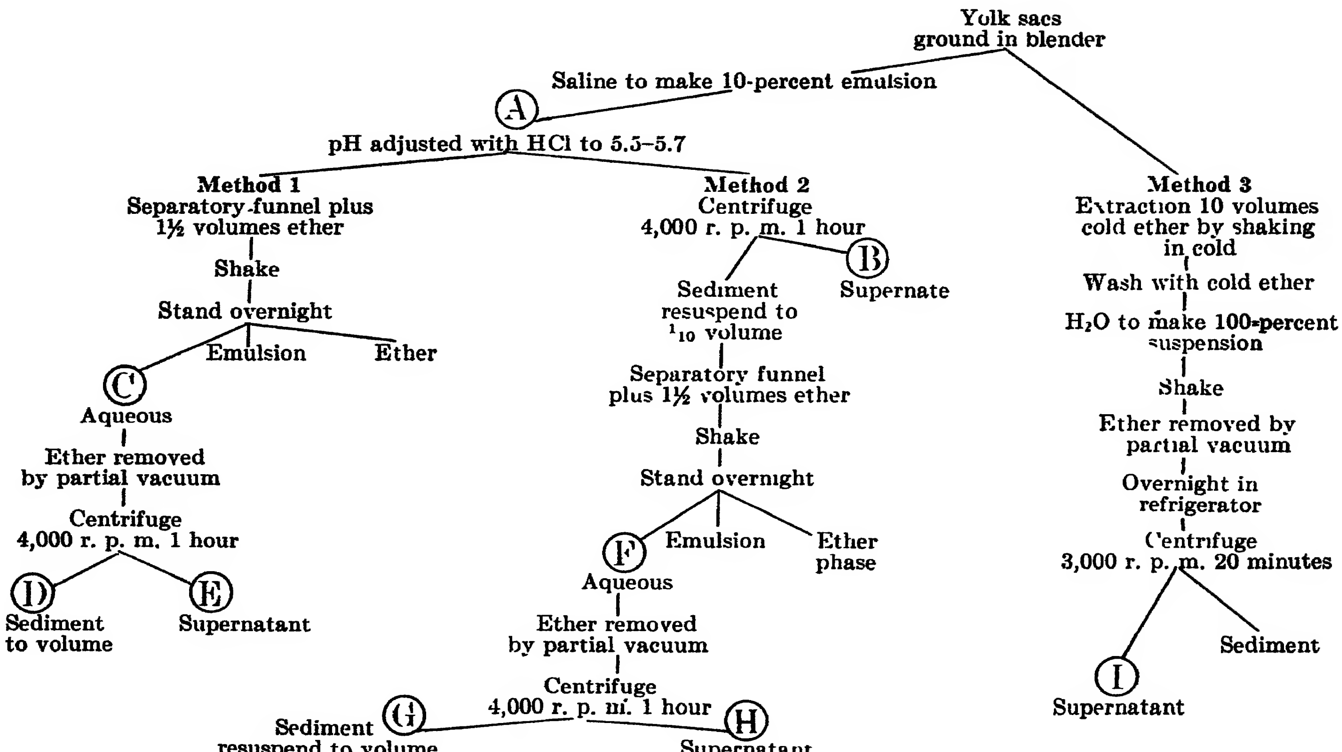

FIGURE 1.—Flow chart Diethyl ether treatment of yolk sac material.

20 to 30 minutes. There is a large amount of reddish-brown sediment which occasionally is not too well packed and may be somewhat difficult to separate from the clear red supernatant. With *Rickettsia orientalis* the supernatant is a satisfactory antigen although the sediment contains considerable antigenic material, some of which may be removed by washing with distilled water.

RESULTS

The results of using these three methods with the five rickettsial agents are summarized in table 1. From this it can be clearly seen that any of the three methods of ether extraction releases a soluble antigen from *R. prowazeki*, *Rickettsia mooseri*, and to a much lesser degree from *Rickettsia rickettsii*. The increased antigenicity with these three rickettsiae is almost entirely accounted for in the supernatants after centrifugation. It must be kept in mind however that antigens prepared by method 2 and method 3 are concentrated tenfold when compared to antigens prepared by method 1.

TABLE 1.—*Results of complement fixation with diethyl ether-treated yolk-sac material. End point titers* [1]

Rickettsiae	Crude 10-percent emulsion		Method 1: 10-percent saline emulsion			Method 2: Sediment (tenfold concentration)			Method 3: Cold-ether extraction
	Whole	Supernatant	Aqueous	Sediment	Supernatant	Aqueous	Sediment	Supernatant	
	Flow-chart designation: A	B	C	D	E	F	G	H	I
R. prowazeki	1:32	1:16	1:512	1:4	1:256	1:2048	1:256	1:2048	[2] >1:2048
R. mooseri	1:64	1:8	1:256	1:8	1:256	1:2048	1:256	1:2048	[2] >1:2048
R. rickettsii	1:2	1:1	1:4	0	1:4	1:32	1:4	1:32	1:32
R. burneti	1:8	0	1:4	1:4	0	1:32	1:32	0	1:4
R. orientalis	1:8	1:4	1:4	0	1:2	1:2	0	1:1	1:128

[1] Only 3+ and 4+ reactions.
[2] No end point at given titer.

With *Rickettsia burneti*, however, there was no increase in antigenicity when infected yolk sacs were extracted with ether; in fact it appears that some may be lost. Here there was no antigen demonstrated in the supernatants after centrifugation, the only active fractions being those containing the rickettsial bodies. In method 3 with *R. burneti*, even though there should have been a tenfold final concentration of any soluble antigen, the titer was lower than that of the original material.

R. orientalis differs from the others in that with either method 1 or 2 there is no release of soluble antigen by ether extraction. Here large numbers of rickettsiae go into the interphase, causing a reduction

in titer from the starting material. This is clearly shown in the results obtained with *R. orientalis* in method 2, where, even with a tenfold concentration, the titers are lower than those of the original material. By method 3, however, a satisfactory antigen can be prepared from yolk sacs infected with *R. orientalis*.

DISCUSSION

Fundamental differences in the antigenic constitution of the various rickettsial agents can probably be demonstrated by the methods of ether extraction described. A relatively large amount of soluble antigen can be released by any one of the three methods from *R. prowazeki* and *R. mooseri*. A lesser amount can be released from *R. rickettsii*. No soluble antigen however can be demonstrated after ether extraction of *R. burneti*. These four rickettsiae, however, all remain in the aqueous phase, but *R. orientalis* is attracted to the interphase and leaves the aqueous phase. Further, since methods 1 and 2 fail to release a soluble antigen from *R. orientalis* and the rickettsiae are attracted to the emulsion, neither method is satisfactory for antigen preparation.

Distilled water is used in method 3 to take advantage of the fact that approximately 75 to 80 percent of the protein in egg yolk is vitellin which is a globulin-like protein insoluble in water (*6*). The remaining 20 to 25 percent of protein in egg yolk is mainly livetin which behaves as a pseudoglobulin, soluble in water, and is not removed in the processing as described under method 3. When antigens are prepared according to method 1 (similar to production methods for typhus vaccine) it has been noted frequently that after standing for some time an insoluble sediment appears. This is probably due to the vitellin in saline solution slowly splitting off lecithin and thereby becoming insoluble.

The soluble antigen released by ether from three of the rickettsiae (except that derived from *R. orientalis* processed by method 3) behaves somewhat as a pseudoglobulin. It is soluble in distilled water, physiologic saline, 8 percent cold ethanol, and 20 percent ammonium sulfate. It is precipitated by 40 to 45 percent ammonium sulfate and 25 percent cold ethanol. These differences in solubility allow for further purification and concentration if desired. It has recently been observed that ether used in a similar manner releases a soluble antigen from certain of the gram-negative bacteria (*7*).

Although it has been reported that slight denaturation occurs with ether extraction of *R. prowazeki* (*8*), this has not been of sufficient magnitude to interfere with these antigens in the immunization of animals or man. There have been several reports indicating that ether processing improves the immunogenic properties of epidemic typhus vaccine (*9*) Fractions C, D, and E (see flow chart, fig. 1)

have all been shown to be effective antigens for immunization of animals (*10*). Fraction H has been shown to produce complement fixing and neutralizing antibodies as well as resistance to challenge with passage virus of epidemic typhus in guinea pigs (*11*). Groups of mice immunized with fractions C through I prepared from yolk sacs infected with murine typhus, when challenged intraperitoneally with the toxic substance from murine-infected yolk sacs, have all shown varying degrees of resistance to the immediate toxic effect as well as to the infection.

With antigens prepared from yolk sacs infected with tsutsugamushi, however, no definite evidence of immunity in mice, when vaccinated subcutaneously and challenged intraperitoneally, has as yet been established. Since the infected yolk-sac material killed with formalin does not immunize either, it is not known whether processing with ether is deleterious to the antigen or whether other factors are operating to prevent demonstrable immunization.

SUMMARY

Three methods for the preparation of antigen from yolk sacs of hen's eggs infected with rickettsiae have been developed. All three methods utilize some of the properties of diethyl ether in the purification of the antigen. No single method is satisfactory for all the five species of rickettsiae studied. The results of antigen titrations against homologous antiserums are presented and discussed.

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THE TROPICAL DISEASE EDUCATION PROGRAM OF THE UNITED STATES PUBLIC HEALTH SERVICE [1]

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At the general meeting in 1944, the American Society of Tropical Medicine adopted the recommendations of its Committee on War and Post-War Problems.[2] This committee was concerned with what the society might do to aid in solving medical problems arising from the return of our military forces who had been in intimate contact with diseases of the tropics in many parts of the world. The diseases considered most likely to constitute a major problem are: (1) Malaria, (2) amebiasis, (3) filariasis, (4) hookworm, (5) leishmaniasis, (6) schistosomiasis, and (7) echinococcosis.

The recommendations specifically requested the Surgeon General of the United States Public Health Service to consider:

(*a*) The organization of several teaching teams to visit State and other laboratories for the instruction of personnel in techniques of the laboratory diagnosis of the common tropical diseases.

(*b*) The dissemination of appropriate articles on the diagnosis and treatment of tropical diseases through its district directors to the practicing physician by means of State and local public health and medical publications.

(*c*) The formation of a library of teaching films on tropical diseases to be loaned to medical societies and other appropriate organizations.

A progress report on the development of this program was given by Dr. R. E. Dyer, Director, National Institute of Health.[3]

Early in November of 1944 the Public Health Service established a small office in Washington under the direction of Dr. L. L. Williams, Jr., who was assigned a parasitologist to assist him in developing the Tropical Disease Education program.

In order to meet urgent needs in the development of an international health program, Dr. Williams was transferred to the State Department early in 1945. On February 21, 1945, the Tropical Disease Education program was transferred to Atlanta, where it was incor-

[1] From the Bureau of State Services, Office of Malaria Control in War Areas, Atlanta, Ga. (Presented at the meeting of the American Society of Tropical Medicine, Cincinnati, Ohio, Nov. 14, 1945.)

[2] War and Post-War Tropical Medicine Recommendations of the Committee on War and Post-War Problems of the American Society of Tropical Medicine Tropical Medicine News, 1: 8 11 (October 1944).

[3] The President's message Tropical Medicine News, 2 3 4 (June 1945)

porated into the activities of the Training and Education Division of the Office of Malaria Control in War Areas.

The objectives of this program fall generally into two categories: (1) To increase the adequacy of diagnostic facilities in State health department and other laboratories, and (2) to acquaint the practicing medical and public health profession with facts related to the recognition and management of the diseases concerned, and to stimulate them to use the laboratory facilities available for the diagnosis of these diseases. In the development of the program in the Atlanta office, emphasis has been placed on the first of these objectives.

Plans were made to recruit and train ex-servicemen as technicians, who would then be assigned to State health department laboratories. These men were to serve both as diagnostic technicians in the laboratory and to train other technicians throughout the State in the laboratory diagnosis of tropical diseases. It became obvious that the plan to recruit and train veterans was not feasible at that time. Competent personnel was not available, and courses adapted to the specific needs of these veterans were not being offered by universities.

The plan was abandoned in favor of a program offering intensive training in the diagnosis of parasitic diseases to technicians already employed by State and local health department laboratories. At the meeting of the State and Territorial Health Officers in Washington, D. C., on April 10, it was stated that facilities would be developed in the Atlanta office for training technicians in the laboratory diagnosis of parasitic diseases. The first formal course was scheduled to begin on October 1, 1945. Eligible for admission to this course, with travel and per diem allowance, were: (1) Qualified personnel now employed by the Public Health Service, (2) all qualified personnel from State and local health departments and nonprofit institutions or agencies within the State who are certified by the State health officer and cleared with the district director.

The major portion of the effort on the part of those responsible for the development of the program has been expended in procuring space, equipment, materials, and personnel, to offer a first-class course in the diagnosis of parasitic diseases. Early in July Dr. Marion M. Brooke joined the staff of the Training and Education Division to direct the development of this course and other parasitological activities. In August 1945 Surgeon S. E. Miller of the Public Health Service was transferred to Atlanta to direct the Diagnostic and Training Laboratory, of which the training course for technicians is one activity.

On October 1, the initial 6 weeks' course was opened with 24 students from 19 States attending. The first 2 weeks of the course were devoted to the microscopical diagnosis of malaria. The following 4 weeks offered intensive training in the diagnosis of hemoflagellates and filarial worms, techniques of fecal examination, diagnosis of

intestinal protozoa, and the diagnosis of intestinal helminths. Instruction in the diagnosis of malaria was given by Miss Aimee Wilcox of the National Institute of Health Malaria Investigations Laboratory. The remainder of the course was presented by members of the staff of the Diagnostic and Training Laboratory. Due to the excellent cooperation and interest of a number of institutions, a constant source of fresh, living material was available to the students for laboratory study. Thus the students had an opportunity to work with the types of specimens encountered in diagnostic laboratories. The first group of students completed the course November 9. A number of these students have already planned to offer similar training to other technicians in the laboratory where they are employed. Efforts will now be made, through the district directors and State health departments, to inform practicing physicians in those States where technicians have been trained, that a diagnostic service in tropical diseases is available.

This course will be repeated every 3 months as long as such training is desired by State and local health departments. In the near future the course will be made flexible enough to provide short periods of training for those interested only in certain parasitic diseases.

Only a small fraction of public health workers will be able to attend formal courses at any one time. However, the majority of laboratory workers would profit by certain continuing training experiences. In line with this principle, there has been established an extension service of the Diagnostic and Training Laboratory. So far the service has been limited to the sending of stained malaria smears to the various State health departments. A number of local or district health department laboratories have been added to the list and there have been requests from numerous private laboratories to be included in this service. Once a month, two malaria smears, with keys to their correct identification, are mailed to the laboratory directors. These slides are useful in checking the accuracy of the technicians and also are of value to those laboratories where such specimens are rare. The laboratories are permitted to retain the slides as a part of their permanent collection of reference and teaching materials.

The present mailing list includes 105 laboratories in 43 States. The service has been developed through the Public Health Service district offices and in turn through State health departments. The present policy is to include on the mailing list any laboratories recommended by a State health officer. At an early date this extension service will be expanded to include specimens of other parasitic diseases. Comments from the directors of laboratories and from State health officers have indicated that this type of service meets a real need.

The preparation of parasitic specimens for study purposes is not limited to the extension service, but specimens are furnished also to various technical and professional training centers. In the develop-

ment of the specimen-preparation service, the Atlanta office has worked in close cooperation with the Distribution Center for Parasitological Material which has been operating for several years at the Army Medical Center. Early in the year a technician was employed by this office and assigned full time to the Distribution Center. Positive malaria slides of the three common species of *Plasmodium* were furnished to the Center by the Malaria Control in War Areas office and the Malaria Research Laboratory at Columbia, S. C., for redistribution.

To further assist State and local health department laboratories in the diagnosis of parasitic diseases, the Diagnostic and Training Laboratory in Atlanta is now offering consultative diagnostic service. As personnel becomes available it is planned to offer field investigation services whenever outbreaks of tropical diseases occur. A limited service of this type was provided during an outbreak of amebic dysentery in an Alabama institution. Assistance was given by the National Institute of Health and the Atlanta office.

In considering the best approaches to the second major objective, that of acquainting the practicing medical and public health profession with facts related to the recognition and management of the diseases concerned, it was felt that a tropical disease information service would best meet the need. The policy at present is to concentrate on furnishing services to those groups already engaged in professional education. Emphasis has been placed on the development of visual materials which would be useful in teaching tropical medicine in medical schools and in conducting programs on tropical diseases before medical societies and other groups. On July 1, 1945, Senior Assistant Surgeon David S. Ruhe was assigned to develop this phase of work.

A film strip on schistosomiasis has already been completed and a number of other units are now in preparation. To insure the technical accuracy of these units it is our policy to call upon specialists in the various fields to review and approve their content.

In order to have access to clinical cases and laboratory material, the Atlanta office has entered into a cooperative arrangement with Moore General Hospital at Asheville, N. C. The staff at Moore General Hospital, where the Army is concentrating its tropical disease cases, has been most helpful in making available materials for photographing.

With the release of physicians from the armed forces, a large number of well-qualified medical men, with a background of experience in the diagnosis and treatment of tropical diseases, will be scattered over the United States. It is our plan to enlist the aid of these qualified individuals in conducting programs on tropical medicine before their own medical societies. Lantern slides, film strips, refer-

ence digests and other materials will be made available to them for that purpose at the earliest possible date.

The establishment of a library for audio-visual materials is still in a formative stage. A number of other plans to increase the knowledge of, and interest in, tropical diseases are being developed, but the announcement of various services will be delayed until they can actually be offered. The United States Public Health Service will continue to make every effort to meet existing needs by offering appropriate services with the advice and guidance of health departments and professional workers and will join with them in furnishing leadership in meeting any threat, actual or potential, to the health of the Nation from tropical diseases.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

March 24–April 20, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended April 20, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Diphtheria.—The incidence of diphtheria continued at a relatively high level, the number of cases (1,274) reported for the 4 weeks ended April 20 being 25 percent above the incidence for the corresponding 4 weeks in 1945 and 40 percent above the 1941–45 median. The number of cases was higher than the median expectancy in each section of the country, but the greatest excesses were reported from the Middle Atlantic and Mountain sections. For the country as a whole the current incidence was the highest reported for this period since 1939 when 1,322 cases were reported for the corresponding 4-week period.

Measles.—The number of reported cases of measles rose from 117,342 during the preceding 4 weeks to 152,615 during the current 4 weeks. For the country as a whole the current incidence was the highest since 1939 when approximately 219,000 cases were reported for the corresponding 4-week period. The New England, West North Central, and East South Central sections reported a relatively low incidence; in the South Atlantic section the number of cases was only

slightly above normal, but in other sections the incidence ranged from 1.3 times the median in the East North Central section to 2.4 times the median in the Middle Atlantic section.

Poliomyelitis.—The number of cases of poliomyelitis dropped from 142 during the preceding 4 weeks to 111 during the 4 weeks ended April 20. The number was less than 90 percent of the 1945 incidence but it was 1.4 times the 1941–45 median. The incidence was relatively high in all sections except the West North Central and East South Central sections. In the Mountain and Pacific sections the numbers of cases were about 3 times the median and in the Middle Atlantic and West South Central sections the incidence was about 2 times the median; smaller increases were reported from the other sections.

DISEASES BELOW MEDIAN PREVALENCE

Meningococcus meningitis.—The cases of this disease dropped from 756 during the 4 weeks ended March 23 to 440 during the 4 weeks ended April 20. The number of cases was less than 70 percent of the 1945 incidence (794 cases) which figure also represents the 1941–45 median for this period. While the current incidence compares very favorably with the 1941–45 median, which contained 3 years in which this disease was unusually prevalent, the number of cases was more than twice the median (approximately 250 cases) for more normal years (1938–42).

Scarlet fever.—The incidence of this disease was also relatively low, the 15,894 cases reported for the 4 weeks ended April 20 being about 75 percent of the 1945 incidence for the corresponding period and 90 percent of the 1941–45 median. Of the 9 geographic sections only 3, the Middle Atlantic, South Atlantic, and Pacific sections, reported an increase over the normal seasonal expectancy. With the exception of the year 1942 when 14,686 cases were reported for the corresponding 4 weeks, the current incidence was the lowest in the 18 years for which these data are available.

Smallpox.—Of the total of 60 cases of smallpox reported for the 4 weeks ended April 20, 38 occurred in the State of Washington. Up to April 20 there were 38 cases reported in the Seattle-King County area; the number of cases, however, dropped from 19 (the highest weekly figure) during the first week of the current period to 4 during the last week. To the same date, 12 cases were reported from California. The outbreak of this disease followed exposure to a case in a soldier returned from the Orient. In all sections except the Pacific the incidence either approximated the 1941–45 median figures or fell below them.

Typhoid and paratyphoid fever.—The number of cases (241) of these diseases was slightly higher than during the corresponding period in 1945, but it was lower than the 1941–45 median (255 cases). The

Number of reported cases of 9 communicable diseases in the United States during the 4-week period March 24–April 20, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period, 1941–45

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,274	1,008	903	7,219	7,352	11,488	152,615	16,857	104,804
New England	37	32	29	19	117	27	7,487	1,100	8,71
Middle Atlantic	202	129	132	17	30	71	49,711	1,047	20,955
East North Central	205	166	166	276	180	129	35,074	1,528	20,305
West North Central	103	70	70	30	46	189	7,441	686	8,226
South Atlantic	191	131	131	1,975	1,825	3,370	11,886	1,308	11,745
East South Central	90	85	83	375	278	917	3,182	407	3,443
West South Central	177	169	169	3,831	4,277	4,277	11,676	2,730	8,672
Mountain	84	50	50	495	450	681	8,097	1,192	4,643
Pacific	125	176	84	201	119	362	18,061	6,199	7,945
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	550	794	794	111	128	80	15,894	20,892	17,006
New England	28	39	45	3	2	2	1,287	2,211	2,211
Middle Atlantic	140	155	155	19	30	10	6,009	5,679	5,470
East North Central	112	152	152	10	15	7	3,948	5,160	5,160
West North Central	42	72	72	4	5	5	1,194	1,705	1,576
South Atlantic	68	122	122	17	14	10	1,340	1,958	1,120
East South Central	51	68	68	5	30	9	344	509	620
West South Central	48	73	73	21	24	10	314	617	492
Mountain	9	10	10	11	1	4	397	907	855
Pacific	52	103	103	21	7	7	1,061	2,146	841
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	60	54	96	241	230	255	7,216	10,036	14,201
New England	0	0	0	9	7	12	901	1,124	1,217
Middle Atlantic	0	0	0	23	37	40	1,627	1,997	3,018
East North Central	7	21	21	30	26	27	1,476	1,468	2,902
West North Central	3	12	12	14	5	8	214	243	531
South Atlantic	0	2	3	31	59	63	1,016	1,610	1,610
East South Central	2	3	4	26	25	23	285	207	606
West South Central	4	5	19	73	52	50	848	1,160	1,160
Mountain	2	5	2	15	13	13	378	474	577
Pacific	42	6	6	20	6	17	471	1,062	1,706

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

greatest excess over the median was reported from the West South Central section; the Middle and South Atlantic Coast sections reported appreciable declines from the normal seasonal incidence, and in all other sections the incidence was about normal.

Whooping cough.—There were 7,216 cases of whooping cough reported during the current 4-week period. The number was about 70 percent of the number reported for the corresponding period in 1945 and slightly more than 50 percent of the 1941–45 median. The incidence was relatively low in all sections of the country.

MORTALITY, ALL CAUSES

For the 4 weeks ended April 20 there were 36,708 deaths from all causes reported to the Bureau of the Census by 93 large cities. The preceding 3-year average was 37,708 deaths; the number of deaths was below the average during each week of the current period.

INCIDENCE OF HOSPITALIZATION, MARCH 1946

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover hospital service plans scattered throughout the country mostly in large cities.

Item	March	
	1945	1946
1. Number of plans supplying data	82	81
2. Number of persons eligible for hospital care	17,046,176	20,585,082
3. Number of persons admitted for hospital care	144,576	180,554
4. Incidence per 1,000 persons, annual rate during current month (daily rate×365)	99.8	103.2
5. Incidence per 1,000 persons, annual rate for the 12 months ended March 31, 1946	103.0	107.8
6. Number of plans reporting on hospital days	25	30
7. Days of hospital care per case discharged during month [1]	8.32	9.17

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED APR. 20, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 20, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	9,003	9,040
Average for 3 prior years	9,201	
Total deaths, first 16 weeks of year	158,475	152,334
Deaths under 1 year of age	621	633
Average for 3 prior years	620	
Deaths under 1 year of age, first 16 weeks of year	9,595	10,044
Data from industrial insurance companies:		
Policies in force	67,197,093	67,223,663
Number of death claims	11,184	14,389
Death claims per 1,000 policies in force, annual rate	8.7	11.2
Death claims per 1,000 policies, first 16 weeks of year, annual rate	11.0	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 27, 1946

Summary

Of the total of 8 cases of smallpox reported for the week, 2 occurred in Washington. The total for the year to date for the entire country is 167, as compared with 175 for the same period last year and a 5-year (1941–45) median of 377. (See p. 721.)

A total of 40,072 cases of measles was reported, as compared with 37,960 last week and 26,526 for the 5-year median. Increases occurred in the New England, Middle Atlantic, South Atlantic, West South Central, and Pacific areas. An aggregate of 21,374 cases occurred in the Middle Atlantic and East North Central areas, practically the same as last week, increases in New Jersey and Illinois being offset by decreases in Pennsylvania and Wisconsin. The cumulative total is 379,228, as compared with 428,804 for the corresponding period in 1944 and a 5-year median of 314,834.

Of the total of 313 cases of diphtheria (as compared with 296 last week and a 5-year median of 211), a larger number than reported for any corresponding week since 1939, Texas reported 31, New York and California 25 each, Maryland 22, and Pennsylvania, Indiana, and Minnesota 16 each. The total to date is 6,177, as compared with a corresponding 5-year median for the period of 4,826. The next largest number reported for a corresponding period in the past 6 years, 5,970 cases, was reported in 1940.

Of the total of 47 cases of poliomyelitis, as compared with 29 last week and 18 for the 5-year median, Florida reported 14, California 8, and New York 6.

A total of 126 cases of meningococcus meningitis was reported, as compared with 112 last week and a 5-year median of 202. States reporting more than 5 cases each are New York (17), Pennsylvania (11), Michigan (6), Alabama (8), Virginia and Texas (7 each), and California (10). The cumulative figure is 3,075, as compared with 4,009 for the corresponding period last year.

Deaths recorded during the week in 93 large cities of the United States totaled 9,448, as compared with 9,082 last week, 9,105 and 9,322 for the corresponding weeks, respectively, of 1945 and 1944, and a 3-year (1943–45) average of 9,504. The cumulative number is 169,248, as compared with 162,732 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended Apr. 27, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945	
NEW ENGLAND												
Maine	0	0	0	------	------	1	170	1	84	0	2	3
New Hampshire	0	0	0	------	1	------	31	60	49	2	1	1
Vermont	0	0	0	------	------	------	9	11	109	0	0	0
Massachusetts	4	5	3	------	------	------	2,449	215	1,190	3	6	6
Rhode Island	1	1	1	------	33	------	10	------	4	2	1	1
Connecticut	0	2	1	1	3	------	426	126	447	2	2	2
MIDDLE ATLANTIC												
New York	25	14	14	(1)	[1] 2	[1] 7	5,265	62	1,836	17	19	19
New Jersey	7	1	4	8	5	5	4,531	46	1,505	3	6	6
Pennsylvania	16	3	9	2	1	1	3,829	343	1,297	11	13	13
E. NORTH CENTRAL												
Ohio	13	4	4	6	3	12	730	47	568	4	9	9
Indiana	16	3	5	3	1	5	632	54	198	5	4	4
Illinois	8	4	17	1	1	7	1,213	141	918	5	11	11
Michigan [2]	8	5	5	------	1	1	1,696	169	1,078	6	7	7
Wisconsin	0	2	2	43	54	54	3,458	70	1,703	1	3	3
W. NORTH CENTRAL												
Minnesota	16	4	3	------	------	1	53	10	322	3	1	1
Iowa	6	2	2	------	------	1	268	59	213	0	4	1
Missouri	3	1	1	1	3	3	212	20	308	4	7	7
North Dakota	3	0	1	------	------	4	5	15	45	0	0	0
South Dakota	3	3	0	------	------	------	29	16	20	0	0	0
Nebraska	1	4	3	3	3	3	671	92	255	0	1	1
Kansas	4	2	3	2	------	2	402	64	616	3	4	4
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	48	4	15	0	0	1
Maryland [2]	22	14	6	2	3	4	664	25	409	3	4	6
District of Columbia	1	0	0	------	------	------	427	8	132	2	2	4
Virginia	14	11	5	142	70	162	711	66	381	7	7	10
West Virginia	8	3	2	3	2	13	132	45	133	2	2	2
North Carolina	9	5	5	------	------	7	485	33	686	2	4	4
South Carolina	2	8	4	239	258	291	455	53	150	0	2	2
Georgia	2	4	3	5	8	29	262	22	211	0	1	1
Florida	5	6	5	------	1	14	311	28	289	2	11	2
E. SOUTH CENTRAL												
Kentucky	5	4	4	------	------	3	135	28	169	5	5	5
Tennessee	4	3	3	15	30	30	227	70	232	1	6	6
Alabama	3	14	9	11	13	45	143	19	263	8	8	6
Mississippi [2]	6	4	5	------	------	------	------	------	------	0	3	3
W. SOUTH CENTRAL												
Arkansas	3	3	3	44	40	44	149	61	152	2	4	1
Louisiana	6	5	5	47	22	3	287	57	67	0	0	1
Oklahoma	3	3	3	17	17	46	227	33	184	0	1	2
Texas	31	29	26	508	654	711	2,240	654	1,541	7	15	15
MOUNTAIN												
Montana	0	1	2	------	15	15	48	14	115	0	1	1
Idaho	4	0	0	5	1	1	178	52	33	1	2	0
Wyoming	0	0	0	------	------	------	43	14	67	0	0	0
Colorado	6	3	11	10	11	22	1,269	15	308	0	2	2
New Mexico	0	2	2	7	6	5	51	13	72	0	1	0
Arizona	6	0	0	38	85	85	234	27	110	0	0	0
Utah [2]	2	0	0	2	11	5	389	270	154	0	0	0
Nevada	0	0	0	------	217	------	------	2	2	0	0	0
PACIFIC												
Washington	8	2	2	------	------	------	771	241	256	3	3	3
Oregon	2	0	3	6	9	17	398	76	190	0	1	1
California	25	22	18	28	10	80	3,657	1,360	1,360	10	16	16
Total	313	206	211	1,199	1,594	1,741	40,072	4,913	26,526	126	202	202
17 weeks	6,177	4,927	4,826	181,831	57,670	71,036	379,228	49,965	314,834	3,075	4,009	4,009

[1] New York City only.
[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended Apr. 27, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945		Apr. 27, 1946	Apr. 28, 1945	
NEW ENGLAND												
Maine	0	0	0	36	48	23	0	0	0	1	0	0
New Hampshire	0	0	0	16	5	7	0	0	0	0	0	0
Vermont	0	0	0	6	20	10	0	0	0	0	0	0
Massachusetts	2	0	0	183	315	326	0	0	0	1	5	2
Rhode Island	0	0	0	12	27	19	0	0	0	0	0	0
Connecticut	0	0	0	73	83	83	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	6	6	0	705	580	577	0	0	0	1	5	5
New Jersey	0	0	0	170	140	173	0	0	0	3	0	0
Pennsylvania	1	0	0	364	502	502	0	0	0	5	6	3
EAST NORTH CENTRAL												
Ohio	0	1	0	425	397	317	0	0	0	3	4	1
Indiana	0	0	0	100	95	118	1	0	1	3	1	1
Illinois	2	0	0	212	277	277	0	0	1	0	0	1
Michigan [2]	0	1	0	157	251	250	0	1	0	0	1	1
Wisconsin	0	0	0	121	178	178	0	0	1	0	1	0
WEST NORTH CENTRAL												
Minnesota	0	1	0	55	91	72	0	0	0	1	1	1
Iowa	1	0	0	45	59	50	2	0	1	[4] 0	0	1
Missouri	0	0	0	44	82	87	0	0	0	0	0	1
North Dakota	0	1	0	11	35	9	0	0	0	2	0	0
South Dakota	0	0	0	5	17	17	0	0	0	0	0	0
Nebraska	0	0	0	23	113	32	1	0	0	0	0	0
Kansas	0	0	0	38	106	75	0	0	0	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	7	7	18	0	0	0	0	0	0
Maryland [2]	0	0	0	51	146	146	0	0	0	2	0	2
District of Columbia	0	0	0	26	23	20	0	0	0	1	0	0
Virginia	0	0	1	135	81	57	0	0	0	0	0	3
West Virginia	0	0	0	28	68	44	0	0	0	0	1	2
North Carolina	1	0	0	45	51	26	0	0	0	1	2	2
South Carolina	0	0	0	8	13	2	0	0	0	2	2	1
Georgia	0	0	0	4	20	18	0	0	0	3	5	5
Florida	14	4	0	5	16	9	0	0	0	3	6	2
EAST SOUTH CENTRAL												
Kentucky	0	0	0	31	71	71	0	0	0	0	10	4
Tennessee	0	1	1	22	45	45	0	0	0	2	3	3
Alabama	0	0	1	48	25	17	0	0	0	0	0	1
Mississippi [2]	0	0	0	5	7	7	0	0	0	1	4	3
WEST SOUTH CENTRAL												
Arkansas	0	0	0	15	6	7	0	0	0	2	0	1
Louisiana	1	0	0	10	15	9	1	1	1	3	7	7
Oklahoma	1	0	0	5	12	12	0	0	0	1	2	0
Texas	4	6	3	41	100	62	0	0	1	13	17	6
MOUNTAIN												
Montana	1	0	0	10	22	22	0	0	0	2	1	0
Idaho	0	0	0	5	37	37	0	0	0	0	2	0
Wyoming	0	0	0	21	5	12	0	0	0	1	0	0
Colorado	3	0	0	39	45	44	0	0	0	1	0	1
New Mexico	0	0	0	10	12	7	1	0	0	0	1	0
Arizona	1	0	0	11	55	12	0	0	0	0	1	0
Utah [2]	0	0	0	31	23	19	0	0	0	0	0	0
Nevada	0	0	0	------	0	0	0	1	0	0	0	0
PACIFIC												
Washington	1	2	1	12	115	44	2	0	0	1	0	0
Oregon	0	0	0	28	32	16	0	0	0	0	0	0
California	8	4	3	170	426	145	0	[4] 0	0	[4] 5	3	3
Total	47	27	18	3,624	4,899	4,104	8	3	15	65	91	87
17 weeks	651	580	401	59,920	93,945	67,902	167	[4] 175	377	[4] 845	995	1,223

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately as follows: Massachusetts, 1; Georgia, 2; Louisiana 1; Texas, 2; Colorado, 1; California 1.
[4] Delayed reports: Iowa, typhoid fever, 21 cases; California, smallpox, 1 case, Camp Beale (Marysville).

Telegraphic morbidity reports from State health officers for the week ended Apr. 27, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— Apr. 27, 1946	Whooping cough: Week ended— Apr. 28, 1945	Whooping cough: Median 1941–45	Week ended Apr. 27, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	25	32	19	------	------	------	------	------	------	------	1
New Hampshire	------	------	------	------	------	------	------	------	------	------	------
Vermont	25	25	23	------	------	------	------	------	------	------	1
Massachusetts	*122	129	140	------	4	------	------	------	------	------	3
Rhode Island	7	18	20	------	------	------	------	------	------	------	2
Connecticut	46	65	65	------	------	------	------	------	------	------	------
MIDDLE ATLANTIC											
New York	149	238	238	1	8	------	2	------	------	------	6
New Jersey	165	153	153	------	------	2	1	------	------	------	1
Pennsylvania	126	205	243	------	------	------	------	------	------	------	2
EAST NORTH CENTRAL											
Ohio	69	201	190	------	------	------	------	------	------	------	------
Indiana	40	17	39	1	------	------	------	------	------	------	1
Illinois	111	22	72	5	2	------	------	------	------	------	14
Michigan [3]	90	72	150	------	4	------	------	------	------	------	------
Wisconsin	104	60	119	------	------	------	1	------	1	------	8
WEST NORTH CENTRAL											
Minnesota	18	9	40	2	------	------	1	------	------	------	5
Iowa	29	5	20	1	------	------	------	------	------	------	2
Missouri	16	19	19	------	------	------	------	------	1	------	------
North Dakota	------	5	3	------	------	------	------	------	------	------	2
South Dakota	------	6	6	------	------	------	------	------	------	------	------
Nebraska	------	12	18	------	------	------	12	------	------	------	------
Kansas	15	25	41	------	------	------	------	------	------	------	2
SOUTH ATLANTIC											
Delaware	1	2	1	------	------	------	------	------	------	------	------
Maryland [3]	14	65	65	------	------	------	1	------	------	------	3
District of Columbia	7	6	22	------	------	------	------	------	------	------	------
Virginia	32	47	62	------	------	53	------	1	1	2	1
West Virginia	29	17	17	------	------	------	------	------	------	------	1
North Carolina	55	160	160	1	------	------	------	------	------	1	------
South Carolina	38	92	81	4	17	------	------	------	3	4	------
Georgia	9	14	28	------	------	------	------	------	------	3	6
Florida	5	15	23	5	------	------	------	------	------	2	1
EAST SOUTH CENTRAL											
Kentucky	8	28	43	------	------	2	2	------	------	------	------
Tennessee	27	24	42	------	1	1	------	1	3	1	------
Alabama	13	22	22	------	------	------	------	------	------	3	1
Mississippi [3]	------	------	------	------	------	------	------	------	------	2	5
WEST SOUTH CENTRAL											
Arkansas	7	15	38	1	------	------	------	1	2	1	1
Louisiana	7	14	8	2	------	------	------	------	------	2	------
Oklahoma	4	8	36	------	------	------	------	------	------	------	------
Texas	229	391	339	10	379	38	------	------	------	23	15
MOUNTAIN											
Montana	3	16	14	------	------	------	------	2	------	------	------
Idaho	12	8	2	------	------	------	------	------	------	------	------
Wyoming	1	------	3	------	------	------	------	1	------	------	------
Colorado	53	15	25	------	------	------	1	1	------	------	10
New Mexico	5	14	26	------	1	1	------	------	------	------	------
Arizona	14	35	24	------	------	35	------	------	------	------	------
Utah [3]	31	33	47	------	------	------	------	------	------	------	1
Nevada	------	------	------	------	------	------	------	------	------	------	------
PACIFIC											
Washington	47	29	45	------	------	------	------	------	------	------	1
Oregon	12	19	28	------	------	------	------	------	------	------	1
California	90	425	375	2	4	------	------	------	------	1	5
Total	1,913	2,832	3,889	35	420	132	21	7	11	45	102
Same week, 1945	2,832	------	------	40	361	101	4	8	10	61	96
Average, 1943–45	2,902	------	------	33	284	87	13	[5] 9	11	[5] 33	------
17 weeks: 1946	30,962	------	------	643	4,939	1,739	152	21	315	782	1,351
1945	42,080	------	------	482	7,463	1,976	114	16	285	821	1,466
Average, 1943–45	47,017	------	[5] 65,384	480	4,806	1,296	164	[5] 24	247	[5] 350	------

[3] Period ended earlier than Saturday.
[5] 5-year median, 1941–45.

Leprosy: Texas 1; California 1.

* Delayed report: Massachusetts, week ended Apr. 13, whooping cough, 111 cases (instead of 0).

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 20, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0		0		0	1	0	3	0	0	4
New Hampshire:												
Concord	0	0		0		0	1	0	3	0	0	
Vermont:												
Barre	0	0		0	1	0	0	0	1	0	0	
Massachusetts:												
Boston	0	0		1	422	1	1	0	34	0	0	8
Fall River	0	0		0	121	0	2	0	0	0	0	2
Springfield	0	0		0	40	0	1	0	11	0	0	
Worcester	0	0		0	290	0	7	0	5	0	0	20
Rhode Island:												
Providence	1	0		0	7	0	2	0	6	0	0	34
Connecticut:												
Bridgeport	0	0		0	1	0	0	0	5	0	0	1
Hartford	0	0		0	2	0	0	0	5	0	0	17
New Haven	0	0		1	59	0	1	0	1	0	0	6
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0		0	188	2	7	0	9	0	0	7
New York	17	2		0	1,447	7	62	1	530	0	2	25
Rochester	0	0		0	766	1	3	0	20	0	0	
Syracuse	0	0		0	39	0	1	0	11	0	0	1
New Jersey:												
Camden	2	0		0	46	1	3	0	3	0	0	4
Newark	0	0		0	1,021	0	5	0	18	0	0	17
Trenton	0	0		0	19	0	1	0	5	0	0	
Pennsylvania:												
Philadelphia	2	0		0	495	4	18	0	50	0	0	9
Pittsburgh	3	0	2	2	12	4	4	0	35	0	1	5
Reading	0	0		1	106	0	3	0	8	0	0	6
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0		0	92	2	10	0	10	0	0	5
Cleveland	0	0	3	2	116	3	5	0	44	0	0	14
Columbus	3	0		0	5	0	3	0	11	0	0	
Indiana:												
Fort Wayne	0	0		0		1	4	0	0	0	0	
Indianapolis	0	0		1	240	0	4	0	18	0	0	15
Terre Haute	0	0		0	5	0	0	0	0	0	1	
Illinois:												
Chicago	0	0	1	0	418	1	32	0	90	0	0	26
Springfield	0	0		0	6	0	2	0	4	0	0	1
Michigan:												
Detroit	1	0		0	629	2	16	0	62	0	0	36
Flint	0	0		0	1	0	2	0	8	0	0	1
Grand Rapids	0	0		0	145	1	1	0	5	0	0	1
Wisconsin:												
Kenosha	0	0		0	27	0	0	0	0	0	0	
Milwaukee	0	0		0	3,012	1	2	0	22	0	0	31
Racine	1	0		0	19	0	0	0	4	0	0	
Superior	0	0		0		0	0	0	1	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0		0	9	0	0	0	1	0	0	3
Minneapolis	2	0		0	8	1	3	0	6	0	0	
Missouri:												
Kansas City	0	0		0	38	0	9	0	12	0	0	
St. Joseph	0	0		0	3	0	0	0	0	0	0	
St. Louis	2	1		0	90	0	7	0	20	0	0	

City reports for week ended Apr. 20, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza: Cases	Influenza: Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	1	----	1	39	0	1	0	2	0	0	----
Kansas:												
Topeka	0	0	----	0	7	0	0	0	20	0	0	7
Wichita	0	0	1	0	73	1	4	0	4	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	----	0	42	0	2	0	4	0	0	----
Maryland:												
Baltimore	21	0	----	1	361	2	7	0	32	0	0	6
Cumberland	0	0	----	0	----	0	0	0	3	0	0	----
Frederick	0	0	----	0	----	0	0	0	0	0	0	----
District of Columbia:												
Washington	3	0	----	0	269	1	6	0	38	0	5	3
Virginia:												
Lynchburg	0	0	----	0	20	0	1	0	3	0	0	----
Richmond	0	0	----	1	18	1	1	0	11	0	0	3
Roanoke	0	0	----	0	7	0	0	0	5	0	0	----
West Virginia:												
Charleston	2	0	----	0	----	0	0	0	1	0	0	----
Wheeling	2	0	----	0	2	0	0	0	0	0	0	21
North Carolina:												
Raleigh	0	0	----	0	31	0	1	0	0	0	0	----
Wilmington	0	0	----	0	10	0	1	0	0	0	0	----
Winston-Salem	0	0	----	0	32	0	3	0	1	0	0	9
South Carolina:												
Charleston	0	0	2	0	27	0	0	0	2	0	0	1
Georgia:												
Atlanta	0	0	----	0	24	0	3	0	1	0	0	----
Brunswick	0	0	----	0	2	0	0	0	0	0	0	----
Savannah	0	0	1	0	2	0	0	0	2	0	0	----
Florida:												
Tampa	3	0	----	0	39	0	0	1	3	0	0	1
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	1	2	53	0	5	0	1	0	1	8
Nashville	0	0	----	1	4	0	0	0	0	0	0	1
Alabama:												
Birmingham	0	0	----	1	23	0	1	0	0	0	0	2
Mobile	1	0	----	0	1	0	0	0	2	0	0	----
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	2	0	----	0	17	0	0	0	1	0	0	2
Louisiana:												
New Orleans	7	0	6	0	21	4	3	2	8	0	3	3
Shreveport	1	0	----	0	----	0	5	0	0	0	2	----
Texas:												
Dallas	0	0	----	0	48	0	4	0	3	0	0	1
Galveston	0	0	----	0	3	0	1	0	1	0	0	----
Houston	3	0	----	0	11	0	0	0	0	0	3	----
San Antonio	1	0	----	0	22	0	3	0	0	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	----	0	----	0	0	0	0	0	0	----
Great Falls	0	0	----	0	2	0	0	0	1	0	0	----
Helena	0	0	----	0	2	0	0	0	0	0	0	----
Missoula	0	0	----	0	----	0	0	0	0	0	0	----
Idaho:												
Boise	0	0	----	0	----	0	0	0	1	0	0	----
Colorado:												
Denver	1	0	1	0	821	1	3	0	9	0	0	17
Pueblo	0	0	----	0	40	0	0	0	1	0	1	1
Utah:												
Salt Lake City	0	0	----	0	114	0	2	0	5	0	0	7

City reports for week ending Apr. 20, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	1	0		0	80	0	3	0	4	4	0	6
Spokane	0	0		0	97	0	2	0	5	0	1	3
Tacoma	0	0		0	11	0	0	0	1	0	0	5
California:												
Los Angeles	0	0	7	0	419	2	6	1	29	0	1	10
Sacramento	1	1		0	185	0	2	0	5	0	0	2
San Francisco	0	0	3	0	170	2	8	0	21	0	1	1
Total	89	5	28	15	13,094	46	301	5	1,311	4	22	425
Corresponding week, 1945	59		35	13	1,214		366		1,545	1	16	672
Average, 1940-45	61		99	[1] 29	[2] 6,736		[1] 410		1,645	0	12	903

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: New York 1.
Dysentery, amebic.—Cases: Chicago 1; St. Louis 1; Los Angeles 2.
Dysentery, bacillary.—Cases: Chicago 1; Detroit 1; Baltimore 1; Los Angeles 2.
Dysentery, unspecified.—Cases: San Antonio 13.
Typhus fever, endemic.—Cases: Birmingham 1; New Orleans 4; Houston 1; Los Angeles 2.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 33,978,600)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	2.6	0 0	0.0	5.2	2,465	2.6	41.8	0.0	193	0.0	0.0	240
Middle Atlantic	12.5	0 9	0.9	1.4	1,916	8.8	49.5	0.5	319	0.0	1.4	34
East North Central	4.3	0.0	2 5	1.8	2,904	6.8	49.9	0.0	172	0.0	0.6	81
West North Central	11.3	4.5	2.3	2.3	602	4.5	54.1	0.0	146	0.0	0.0	25
South Atlantic	50.7	0.0	4.9	3.3	1,448	6.5	40.9	1.6	173	0.0	8.2	77
East South Central	5.9	0.0	5.9	23.6	478	0.0	35.4	0.0	18	0.0	5.9	65
West South Central	40.2	0.0	17.2	0.0	350	11.5	45.9	5.7	37	0.0	23.0	20
Mountain	7.9	0.0	7.9	0.0	7,776	7.9	39.7	0.0	135	0.0	7.9	199
Pacific	3.2	1.6	15.8	0.0	1,521	6.3	33.2	1.6	103	6.3	4.7	43
Total	13.7	0.8	4.3	2.3	2,015	7.1	43.3	0.8	202	0.6	3.4	65

PLAGUE INFECTION IN SANTA BARBARA COUNTY, CALIF.

Under date of April 23, plague infection was reported proved, on April 18, in tissue from 1 ground squirrel, *Citellus beecheyi*, shot 1 mile south of Buellton, Santa Barbara County, Calif.

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

As of April 30 no case of smallpox of local origin had been reported in San Francisco since March 27, the date of onset of the last reported local case. To April 30, 9 cases had been reported in San Francisco, 3 with origin outside the United States and 6 with origin within the city. In addition to these cases, 1 case had been reported in San Diego, with origin in the city, and 3 other cases in the State with origin

outside the United States, making a total for the State of 13 cases—7 in civilians and 6 in the military.

During the 9-day period ended April 29, a change of diagnosis in 2 cases from suspected to definite smallpox and 2 new cases brought the total cases in the Seattle-King County area to 53 (including 1 case of hemorrhagic type from Everett, with onset on April 14), and 1 death on April 29 brought the total deaths from smallpox to 13. Onset of last case was on April 22. In addition to these cases, 1 case each had been reported in Longview, Friday Harbor, and Waterville, apparently not associated with the Seattle cases.

TERRITORIES AND POSSESSIONS

Virgin Islands of the United States

Notifiable diseases—January–March 1946.—During the months of January, February, and March 1946, cases of certain notifiable diseases were reported in the Virgin Islands of the United States as follows:

Disease	January	February	March
Chickenpox	1	3	
Diphtheria			1
Dysentery, amebic			1
Filariasis	2	1	
Gonorrhea	23	28	16
Hookworm disease	11	9	7
Measles		1	
Pneumonia			1
Schistosomiasis	1	1	4
Syphilis	12	8	7
Tuberculosis (pulmonary)			3
Typhus fever (murine)		1	

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 30, 1946.—During the week ended March 30, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		13		99	247	21	23	20	13	436
Diphtheria		7	4	20	9	9	1			50
Dysentery, bacillary				1						1
Encephalitis, infectious								1		1
German measles				36	192	2	1	5	1	237
Influenza		10			11	1			16	38
Measles		123	8	800	1,299	18	30	40	12	2,330
Meningitis, meningococcus					2		1	1		4
Mumps		1	1	83	256	70	20	45	34	510
Poliomyelitis					1					1
Scarlet fever		14	8	88	70	12	15	14	2	223
Tuberculosis (all forms)		3	8	193	63	15	12	15	31	340
Typhoid and paratyphoid fever				9	4	1				14
Undulant fever					2			1		3
Venereal diseases:										
Gonorrhea	1	21	17	64	162	48	51	42	115	521
Syphilis	4	14	2	131	139	15	12	4	30	351
Whooping cough		2		57	43	6		9		117

CUBA

Provinces—Notifiable diseases—4 weeks ended March 23, 1946.—During the 4 weeks ended March 23, 1946, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		5	7	2	12	27
Chickenpox	1	14		1	1		17
Diphtheria	4	16	5		1	1	27
Hookworm disease		30		2			32
Leprosy		1	13			2	16
Malaria	17	2		2	8	250	279
Measles		1			1	2	4
Poliomyelitis		1			1	1	3
Tuberculosis	23	59	24	33	15	97	251
Typhoid fever	12	69	11	60	17	33	202
Whooping cough			3				3

[1] Includes the city of Habana.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOWFEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China—Canton.—For the period March 21–31, 1946, 27 cases of cholera with 7 deaths were reported in Canton, China.

India—Calcutta.—For the week ended April 6, 1946, 79 cases of cholera with 43 deaths were reported in Calcutta, India.

Plague

China.—Plague has been reported in Fukien Province, China, as follows: Foochow, March 1–31, 1946, 96 cases, 56 deaths; Pucheng, March 5, 1 case; Yungtai, March 22, 1 case; Lienkong, March 25, 1 case; Nanan, March 1–28, 30 cases; Amoy, April 3, 2 cases. During the period March 1–20, 1946, 11 cases of plague with 1 death were reported in the suburbs of Tengchung, Yunnan Province, China.

Egypt—Alexandria.—For the week ended April 20, 1946, 4 cases of plague were reported in Alexandria, Egypt.

Manchuria—Mukden.—For the period February 25 to March 25, 1946, a total of 39 cases of pneumonic plague with 36 deaths were reported in Mukden, Manchuria. These figures include 19 deaths previously reported.

Smallpox

Morocco (French).—Smallpox has been reported in French Morocco as follows: March 21–31, 1946, 105 cases; April 1–10, 1946, 96 cases.

Sudan (French).—For the period March 21–31, 1946, 105 cases of smallpox were reported in French Sudan.

Typhus Fever

Greece.—During the week ended April 20, 1946, 100 cases of typhus fever with 16 deaths were reported in the Department of Xanthi and 1 case was reported in the Department of Zante, Greece.

Morocco (French).—Typhus fever has been reported in French Morocco as follows: March 21–31, 1946, 282 cases, no specific locations being given. For the period April 1–10, 1946, 284 cases of typhus fever were reported in French Morocco including cases reported by regions as follows: Agadir and frontier districts, 5; Casablanca, 61; Fez, 76; Marrakech, 40; Meknes, 59; Oujda, 1; Rabat, 42.

Tunisia.—For the period April 1–10, 1946, 36 cases of typhus fever were reported in Tunisia, including 3 cases in Tunis and 1 case in Sousse.

Turkey.—For the week ended April 20, 1946, 60 cases of typhus fever were reported in Turkey, including 3 cases in Balikesir, 1 case in Icel, and 1 case in Samsun.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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TRAINING PUBLIC HEALTH WORKERS

PROGRAMS SPONSORED BY STATE HEALTH DEPARTMENTS UNDER TITLE VI OF THE FEDERAL SOCIAL SECURITY ACT AND THE FEDERAL VENEREAL DISEASE CONTROL ACT (1936–44)[1]

By JOSEPH W. MOUNTIN, *Medical Director*, and EMILY K. HANKLA, *Assistant Statistician, United States Public Health Service*

In discussions preceding enactment of Title VI of the Federal Social Security Act (*1*), which became effective during fiscal year 1936, acute need of additional personnel trained for public health work was recognized (*2*), (*3*), (*4*), (*5*), (*6*), (*7*). Hence, provisions were made in the Act which permitted States and Territories to use part of their grants for training purposes. When the Federal Venereal Disease Control Act (*8*), (*9*), (*10*) was passed in 1938, expenditure of funds for personnel training was again authorized. These programs have continued over the years with some fluctuation and change in emphasis until, by the end of fiscal year 1944, grant-in-aid funds administered by the United States Public Health Service alone had contributed to the professional development of more than 7,500 people.

Now, with the release of manpower from pursuits associated with prosecution of the war, there will be opportunities to fill accumulated vacancies and to build the staff organizations required to meet demands for expanded public health services. A vast amount of specialized training will be needed to assure properly qualified personnel for all professional and technical positions. It seems appropriate, therefore, at this time to present the experience accumulated to date by the United States Public Health Service in the support of training programs, both as a record of past accomplishment and for whatever suggestive value it may have in guiding future activities of similar purpose.

Under provisions of Title VI of the Social Security Act, funds appropriated by Congress were made available to the States for general public health work. In the early years of this program,

[1] From the States Relations Division, Bureau of State Services

designated amounts were allotted to States for the specific purpose of developing properly qualified professional or technical personnel (*11*). The percentage of Title VI expenditures devoted to training by the States and Territories amounted to 23.2 in 1936 and gradually declined thereafter. By 1940, this percentage had decreased to 9.1 and by 1944 to 3.3. The proportion of money appropriated under the Federal Venereal Disease Control Act expended for personnel training was highest in 1940, 4.2 percent, and dropped to 1.0 percent in 1944.

States have been permitted to use this money for virtually any items of expense that could be identified as essential to the training program. Among these might be tuition, stipends, general expenses of institutes, honorariums for special lecturers, and travel allowances. Types of programs supported have varied from time to time and among the several States. Observation classes, supervised experience, itinerant counseling, and short institutes, as well as formal instruction in recognized graduate schools have been included. Some States made block grants to schools to assist in the development of courses suited to their needs.

Trainees from each State have been selected by the State health officer. For the most part, they represented actual or prospective employees of State or local health departments, although occasionally persons were admitted from related agencies. A few private practitioners of medicine, dentistry, and nursing took short courses to enable them to participate more fully in special public health programs—notably venereal disease control activities. The State health officer and the trainee together decided upon the kind of education to be pursued and upon the place where it could be obtained most advantageously.

When Title VI of the Social Security Act became effective, there was a great dearth of workers with any specialized training or experience in public health. Scarcely had the more pressing of these personnel deficiencies been overcome when health departments began to lose staff members, especially to the armed services and to war industries. This, combined with the need for additional personnel to meet problems created by the national emergency, made immediate employment of available workers imperative and precluded their absence for extended training. Throughout the entire period, therefore, courses of only a few months' duration have predominated. From now on, as more persons are released from the military services, it is hoped that greater emphasis will be placed on formal instruction extending over a full academic year.

Expenditure figures given in table 1 provide one measure of the extent of the entire training program conducted by State health

departments during the period 1936 to 1944. These data indicate costs of training insofar as they are reflected in fiscal documents submitted to the United States Public Health Service by the several States.[2] It is evident that Title VI funds have carried the largest share of these costs, 70 percent. The next largest portion was paid from miscellaneous sources grouped under "other." Although a complete breakdown of the latter amounts is not available, it can be stated that they consisted chiefly of funds administered by the United States Children's Bureau under provisions of Title V of the Social Security Act. Money provided through the Venereal Disease Control Act accounted for about 8 percent of all expenditures for training during the entire period, while State and local governmental funds represented only 2 percent.

TABLE 1.—*Total expenditures for training*[1] *by State and Territorial health departments, as reported to the United States Public Health Service, distributed according to source of funds for each fiscal year (1936–44)*

Fiscal year	Expenditures from designated source									
	All sources		State and local governments		Title VI—Social Security Act[2]		Venereal Disease Control Act[2]		Other[3]	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
All years	$9,842,718	100.0	$186,197	1.9	$6,907,890	70.2	$805,892	8.2	$1,942,739	19.7
1936[4]	323,749	100.0	4,715	1.5	318,903	98.5			131	(5)
1937	1,209,569	100.0	14,536	1.2	1,160,153	95.9			34,880	2.9
1938	1,420,188	100.0	3,124	.2	1,286,756	90.6			130,308	9.2
1939	1,248,162	100.0	4,958	.4	1,062,193	85.1	70,457	5.6	110,554	8.9
1940	1,163,566	100.0	25,330	2.2	816,209	70.1	165,212	14.2	156,815	13.5
1941	1,433,726	100.0	26,199	1.8	952,720	66.5	160,881	11.2	293,926	20.5
1942	1,315,747	100.0	23,919	1.8	647,670	49.2	157,146	12.0	487,012	37.0
1943	876,072	100.0	20,355	2.3	314,783	35.9	152,945	17.5	387,989	44.3
1944	851,939	100.0	63,061	7.4	348,503	40.9	99,251	11.7	341,124	40.0

[1] Including subsidies for schools and field orientation centers as well as direct assistance to trainees.
[2] Funds administered by the U. S. Public Health Service.
[3] For the most part "other" funds are those administered by the U. S. Children's Bureau under terms of Title V of the Social Security Act. Money donated by foundations is included if handled by the State.
[4] Only 5 months.
[5] Less than 0.1 percent.

Expenditures from Title VI funds, which almost entirely financed the training program in its early years, have decreased both in amount and in the proportion which they represent of the annual totals. Federal venereal disease control funds spent on training have also decreased in amount. Meanwhile, there has been a tendency for the contributions of State and local governments, though remaining relatively very small, to increase. Expenditures from "other" sources, chiefly Federal funds administered under the Children's Bureau,

[2] Expenditures for training as reported include only those made by State health departments from State appropriations and from funds made available to State health departments by Federal or local governments or other agencies. Direct payments by students, special scholarship grants, or expenses borne by schools and other training agencies over and above tuition payments are not included.

have expanded still more. In spite of proportionate changes in the contribution to training from the several sources portrayed in table 1, the total amounts of combined expenditures were at a roughly comparable level from 1937 to 1942, after which there was a large reduction.

Amounts expended for training by the several States and Territories varied widely, as would be expected for areas so divergent in character. Moreover, changes from year to year were relatively much greater for individual States than the national totals would indicate. These differences in training expenditures by fiscal year and by State and Territory are shown in appendix table A (see page 740).

A training program may be described also in terms of the participants, or trainees. Individual records submitted to the United States Public Health Service for persons who had tuition, stipends, or travel expenses paid from funds provided through Title VI or the Federal Venereal Disease Control Act make data available for a general portrayal of educational programs developed over the period. It is believed that the comparisons which will be presented are significant, although the character of the basic data has changed somewhat over the years. Initially, health departments supplied total figures according to broad categories, but were not asked to supply information on individual trainees. The original questionnaire, later revised for use as a trainee application form, was printed in 1938.[3] State health officers were asked at that time to send in completed forms for as many of the persons previously trained as possible as well as for all those then under consideration. Inasmuch as the submission of individual applications for training was not required by regulation until 1941, the data obtained before that time are perhaps somewhat less complete than those for later years.

Altogether, there are records on file for 8,414 separate training periods[4] initiated in the fiscal years 1936 to 1944. Not infrequently, a single person participated in the program on two or more different occasions and is represented by a corresponding number of completed application forms. A check of the schedules indicates that about 10 percent of the individuals trained fall into the above-mentioned category (fig. 1). On the basis of this count, it is estimated that approximately 7,500 different persons are represented by the 8,414 trainee records. The frequency with which individuals received more than one period of training was slightly higher for physicians and nurses than for sanitation personnel and for other types of workers.

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[3] The edition of the application blank adopted in July 1941 and used for the remainder of the study period is attached as appendix B. In most essential respects, it reflects the forms used earlier.

[4] In the interests of convenience and simplicity, the terms "training period" and "trainee" will each be used at times in describing counts obtained from the same source. When totals are so qualified, they will refer to counts of application forms; therefore, an individual is enumerated as many times as there are different application forms describing training which he received.

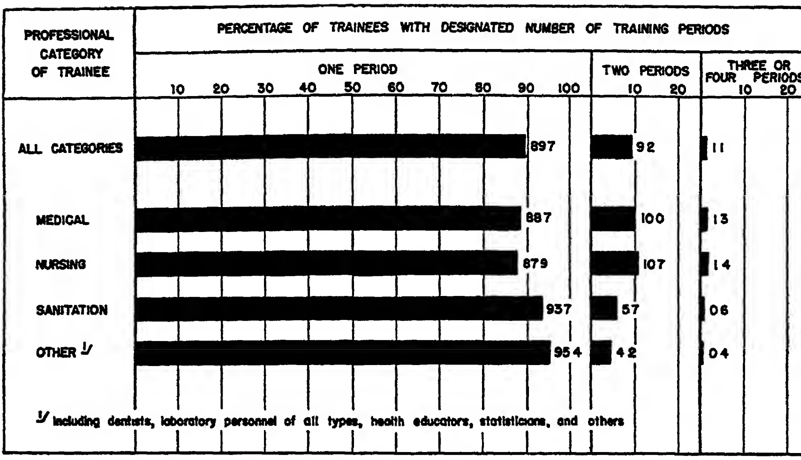

FIGURE 1.—Percentage distribution of trainees in different professional categories by number of training periods (1936–44).

Distribution of Trainees by Professional Category

More than half, or 55 percent, of the 8,414 trainees were nurses (table 2). This professional group was especially prominent during the first 2 years of the program when, according to available data, 85 percent of all trainees were nurses. After 1939, the percentage of nurses ranged around 50, varying from 46 to 54. The relative position of physicians, who made up 18 percent of the trainees for the entire period covered, rose from 4 percent in 1936 to 33 in 1940 and then

TABLE 2.—*Distribution of trainees [1] in different fiscal years by professional category (1936–44)*

Fiscal year when training period began	Trainees in designated professional category: All categories		Medical		Nursing		Sanitation		Other [2]	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All years	8,414	100.0	1,550	18.4	4,626	55.0	1,447	17.2	791	9.4
1936	458	100.0	20	4.4	416	90.8	19	4.1	3	.7
1937	685	100.0	59	8.6	556	81.2	60	8.7	10	1.5
1938	1,501	100.0	288	19.2	863	57.5	254	16.9	96	6.4
1939	750	100.0	196	26.1	368	49.1	117	15.6	69	9.2
1940	857	100.0	282	32.9	402	46.9	115	13.4	58	6.8
1941	1,372	100.0	326	23.8	634	46.2	315	22.9	97	7.1
1942	935	100.0	203	21.7	470	50.3	196	21.0	66	7.0
1943	871	100.0	88	10.1	410	47.1	186	21.3	187	21.5
1944	856	100.0	52	6.1	460	53.7	148	17.3	196	22.9
Unknown [3]	129	100.0	36	27.9	47	36.4	37	28.7	9	7.0

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.
[2] Including dentists, laboratory personnel of all types, health educators, statisticians, other professional and technical workers, and 5 of unknown type.
[3] Training periods for which fiscal year of onset is unknown occurred in the years 1936–40 only.

declined each year until 1944, when they represented only 6 percent of the total. The participation of sanitation personnel in the program also began slowly. For the whole period 17 percent of all trainees were in this category; and in 1941, 23 percent. Health workers of other types made up a small fraction of the total until 1943; then the percentage in this group jumped to 22, and in 1944 it was 23.

According to a survey of full-time public health agency personnel made in 1938,[5] the proportion of professional and technical workers then employed in each major category was approximately as follows: Physicians, 12 percent; nurses, 47 percent; sanitation personnel, 27 percent; other professional or technical workers, 14 percent. Comparison of these percentages with trainee-distribution figures (table 2) indicates that, for the years 1938 to 1942 and for the entire period studied, physicians made up a considerably higher proportion of the trainees than they represented on the staffs of health agencies. Short courses in venereal disease control were probably in some measure responsible for the relatively high numbers of medical graduates participating in the program. These courses were approved not only for health department personnel, but occasionally for selected physicians in private practice, medically trained personnel from nonofficial agencies, and others not employed by official health departments, if thereby the work of such individuals could be better integrated with the official public health program.

The proportion of nurses, as we have seen, was very high at the onset of the program but dropped to a lower level in 1939. Since that time it has been only slightly higher than their representation on health department staffs. Sanitation personnel were not included among the trainees in percentages even approximating their reported employment until 1941. Professional public health workers of other types were represented by relatively few trainees in contrast to their numbers in the health departments until 1943 and 1944. In those years, the prominence, both numerically and comparatively of "other" trainees in the program was much greater than ever before, and their estimated proportion in prewar health departments was surpassed. In this group are found dentists, bacteriologists, nutritionists, vital statisticians, health educators, and others. The apparent emphasis on their training in 1943 and 1944 was partly a result of the lowered numbers of other workers, especially physicians available. As public health programs expand, however, the relative importance of personnel in the miscellaneous categories may be expected to increase

[5] Derryberry, Mayhew, and Caswell, George: Qualifications of professional public health personnel. Pub. Health Rep., 55: 2312–2319 (Dec. 13, 1940). Reprint No. 2217. A similar distribution (physicians, 13 percent; nurses, 47 percent; sanitation personnel, 22 percent; and other professional or technical workers, 18 percent) characterized full-time positions reported by the health departments covered in a later study by Perrott, G. St. J., and Dorn, Harold F.: Current needs for health personnel. Pub. Health Rep., 57: 997–1000 (July 3, 1942). Reprint No. 2388.

because of growing tendencies toward specialization and broader participation of the various professional groups.

Age of Trainees

The median age of all trainees, at the midpoint of the fiscal year in which training began, was 31 There was little variation among the professional groups, median ages ranging from 30 to 34 Nurses and sanitation workers were on the average about 4 years younger

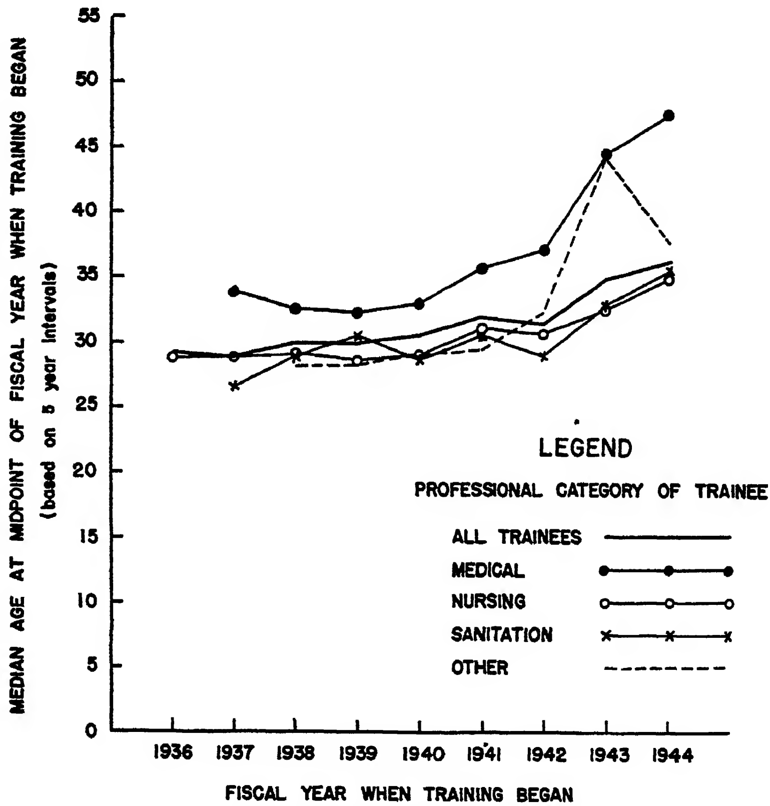

FIGURE 2—Median age of trainees in different professional categories for each fiscal year (1936–44).

than physicians. The median age of all other trainees over the entire period was 33. This average is strongly influenced by the situation in 1943 and 1944 when the number of workers of miscellaneous types who received training was unusually large and when these trainees were considerably older than had been the case earlier. On the whole, median ages increased slightly from 1936 to 1942 and then rose significantly (fig. 2). In all professional categories, median ages were higher in 1943 and 1944 than ever before.

Type of Training Received

Training consisted of academic study in various phases of public health; field practice affiliated with a school of public health, a health department, or some other agency offering supervised field experience; observation tours; training on the job; and conferences or lectures which, though sometimes lasting only a few days, provided instruction in specific aspects of public health work.

About 80 percent of the trainees engaged in academic study, according to the reports. In almost a third of these instances, supervised field practice, as well, was covered by the same application. About 12 percent of all training periods lasted less than 4 weeks, while another 12 percent continued for 9 months or more (table 3). Including the latter, 58 percent were at least 3 months long. Of the training periods which combined field practice with academic study, 84 percent were at least 3 months in length as compared with 61 percent of those which were entirely academic and 18 percent of those consisting of field practice only. When field practice occurred alone, it was frequently nonaccredited as well as short-termed in type.

TABLE 3.—*Distribution of trainees*[1] *with academic study, field practice, or both by length of training period (1936–44)*

Type of training	Trainees receiving training for designated period (in months)															
	Total, all periods		Less than 1		1–2		3–4		5–6		7–8		9–10		11 or more	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All trainees	[2] 8,276	100.0	954	11.5	2,520	30.4	2,333	28.2	741	9.0	736	8.9	557	6.7	435	5.3
Academic study	4,477	100.0	416	9.3	1,341	30.0	1,475	32.9	370	8.3	465	10.4	287	6.4	123	2.7
Field practice only	1,680	100.0	455	27.1	916	54.5	215	12.8	26	1.6	14	.8	18	1.1	36	2.1
Both academic study and field practice	2,100	100.0	82	3.9	251	12.0	639	30.4	344	16.4	257	12.2	251	12.0	276	13.1
Unknown type	19	100.0	1	5.3	12	63.1	4	21.0	1	5.3	----	----	1	5.3	----	----

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.

[2] Not included in this total are 138 individuals with training periods of unknown length.

Most of the early trainees—over 95 percent of those beginning in 1936 or 1937—took academic courses, but the proportion decreased as the years went by until 1943 when 40 percent had field practice only. Training periods initiated in 1937 were generally longer than those started in other years. About 78 percent of them were at least 3 months in length (fig. 3). The greatest decline in duration of training occurred between the fiscal years of 1942 and 1943, when the pressure of the war became acute. Only 37 and 32 percent, respectively, of the training periods which began in 1943 and 1944 lasted for 3 months or more.

Comparison of types of instruction for persons in different professional categories reveals that nurses least often omitted academic study from a training period. Only 12 percent of the nurses, in contrast to 32 percent of the physicians, 32 percent of sanitation personnel, and 22 percent of other types had field training without academic study. In general, training periods were also longer for nurses than for personnel in other categories. The percentage lasting at least 3 months was 67 for nurses, 54 for sanitation workers, 46 for physicians, and 36 for other trainees. The proportion lasting at least 9 months varied little, 11 to 13 percent, among three groups (nurses, physicians,

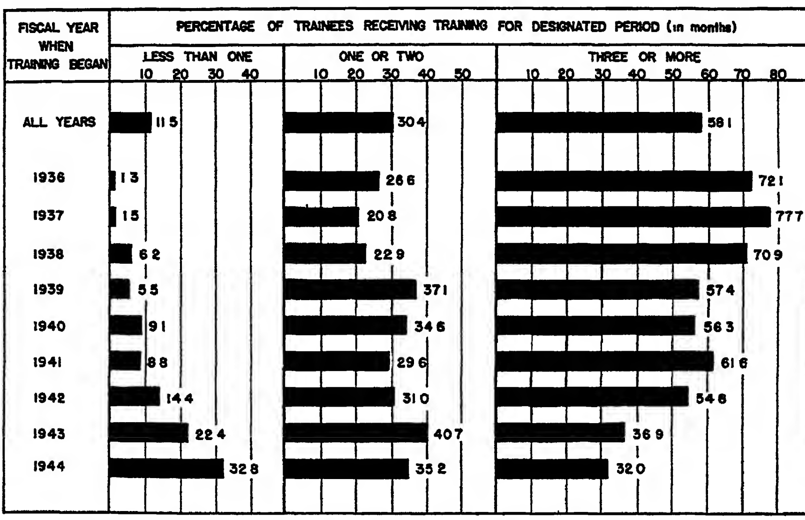

FIGURE 3.—Percentage distribution of trainees in different fiscal years by length of training period (1936–44)

and "other" personnel) but was only 7 percent for sanitation workers. At the opposite end of the scale, 21 percent of medical and 30 percent of "other" workers had training periods of less than 1 month, while only 9 percent of the sanitation workers and about 6 percent of the nurses took courses of such short duration.

Institution Attended

Educational institutions attended by 10 or more trainees during the years 1936 to 1944 are listed, and the total number of trainees during this period [6] distributed according to academic or field training, fiscal year, and broad professional category, in appendix tables B, C, and D. Altogether, the facilities of 80 schools were utilized in the program. Most of these were colleges or universities; the others, schools of special types or laboratories.

[6] Of the 8,414 training periods studied, 57 could not be classified by school or by type of training received. They are omitted, therefore, from appendix tables B, C, and D.

Of the 8,357 training periods which can be classified both by school and by type of instruction, 6,674 involved some academic study which may or may not have been accompanied by a period of field practice, while 1,683 represented field practice without accompanying classwork. Training which was limited to field practice only was seldom under school auspices. Only 172 of these 1,683 training periods represented attendance at centers having school affiliations.

Inspection of the school data reveals great variation in the extent to which individual institutions participated, as measured in numbers trained. Of the 80 colleges, universities, and schools of special types represented in the program, 21 were selected by only a single trainee during the 9-year period studied, while 20 others had fewer than 10 trainees each or an average of not more than 1 per year. These two groups combined provided less than 2 percent of all training periods with school supervision. On the other hand, 17 colleges or universities, each having 100 or more trainees, accounted for 87 percent, and 5 of these, for 47 percent of these training periods. The 5 institutions most frequently selected by participants in the program were, in the order named: The University of Michigan, George Peabody College, and the Universities of Minnesota, Vanderbilt, and Pennsylvania.

As has been shown earlier, there was considerable year-to-year fluctuation in trainee totals. The number of schools which provided academic instruction for 10 or more trainees per year (appendix table C) averaged about 16 and ranged from 10 to 22. Only 4 institutions had as many as 10 trainees every year.

Of the 6,674 trainees with some academic study, 1,049 were physicians, 4,032 nurses, 975 sanitation workers, and 618 professional and technical personnel of other types. Reference to appendix table D reveals that for each class of personnel training was concentrated in a relatively small number of schools.

During the period under discussion, only 23 institutions trained physicians under the program. Six schools, which averaged at least 10 medical trainees per year, accounted for more than 75 percent of the total. Ninety-four percent of all physician trainees with academic study selected schools which offered graduate degrees, diplomas, or certificates in public health [7] during the latter part if not all of the period 1936 to 1944 (*13*).

When nurses were classified according to whether the institution attended was among those with curricula approved by the National

[7] On January 11, 1946, the Committee on Professional Education of the American Public Health Association adopted certain minimum standards for accreditation of institutions giving the degree of Master of Public Health (Diploma of Public Health in Canada) for the academic year 1946-47 (*12*). Nine schools had applied for and received accreditation by January 25, 1946. During the period studied, 1936-44, these institutions were selected by 59 percent of the physician trainees.

Organization for Public Health Nursing (*13*), (*14*), the percentage choosing schools listed at some time during the years 1936 to 1944 stood at 94. In addition, some of the other 6 percent selected institutions which are outstanding in the field of public health but whose curricula are not planned specifically for nurses.

Sanitation workers, as a group, represent a combination of engineers with other workers who may or may not have taken academic courses leading to professional degrees. In the years 1941 to 1944, less than one-fourth of the trainees in this broad category were engineers. In spite of this, however, about two-thirds of all the sanitation personnel trained during the entire period selected schools which were listed for some of these years, 1936 to 1944, as offering graduate degrees in sanitary or public health engineering (*13*). About 38 percent, most of whom are included above, were trained at schools listed by the Engineers' Council for Professional Development (*15*), (*16*) as having applied for and received accreditation for undergraduate curricula in sanitary engineering, public health engineering, or civil engineering with an option in sanitary engineering.

Dentists, bacteriologists, laboratory technicians, vital statisticians, health educators, and all other professional and technical workers outside the medical, nursing, and sanitation fields have been grouped together in an "other" category for this analysis. Of these trainees, 75 percent chose schools which offered graduate degrees in public health [8] (exclusive of engineering and public health nursing) at some time during the period (*13*). Some of the schools selected by the other 25 percent offered public health courses intended for nurses, and others may have been well equipped to give the specific instruction needed by the trainee.

Distribution of Trainees by Geographic Location

The number of persons trained, their distribution by professional category, and even the ratio of trainees to the total population of the State through which the funds were made available has varied considerably among the several States and Territories and, in many of them, from year to year (appendix tables E and F). Division of the number of trainees for the entire period 1936 to 1944 by the 1940 population total for the United States and Territories reveals that, on an average, 6.3 persons were trained for each 100,000 inhabitants. Corresponding ratios for the 48 States ranged from 1.5 in Ohio to 26.6 in North Dakota. Alaska's trainee ratio was highest of all, 27.6, but the totals involved were small.

To simplify comparison among different sections, the continental United States have been grouped into four broad geographic regions

[8] Institutions accredited in January 1946 for giving the degree of Master of Public Health were chosen by 48 percent of these "other" trainees (see footnote 7 and reference 12).

and the Territories into a fifth.[9] Although some of these areas contain States differing widely from each other in the extent of training programs as measured by the relation of trainees to population, the sectional comparisons deserve special notice (table 4). Ratios of trainees to population for the Northeastern (3.9) and Central States (5.0) were considerably below the national average; while for the Western and Southern States, they reached 8.0 and 9.4, respectively. The corresponding ratio for the Territories was 6.4—almost the same as the average for all areas.

TABLE 4.—Total number and percentage distribution by professional category of trainees [1] from each of four geographic divisions of the continental United States and from the outlying Territories (1936–44)

Geographic division [2]	Number of trainees		Percentage distribution of trainees by designated professional category			
	Total all categories	Total per 100,000 population [3]	Medical	Nursing	Sanitation	Other
United States and Territories	8,414	6.3	18.4	55.0	17.2	9.4
States:						
Northeastern	1,500	3.9	17.1	61.2	9.9	11.8
Southern	3,639	9.4	23.7	47.0	22.4	6.9
Central	2,018	5.0	12.4	61.4	13.7	12.5
Western	1,104	8.0	15.3	64.3	13.6	6.8
Territories	153	6.4	6.5	33.3	37.3	22.9

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.

[2] The geographic divisions with the States contained therein are as follows:

Northeastern: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia.

Southern: Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

Central: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Western: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

The Territories include: Alaska, Hawaii, Puerto Rico, and Virgin Islands.

[3] Number trainees for the fiscal years 1936–44 related to population according to the 1940 census.

Distribution by broad professional categories shows emphasis on different classes of trainees within the several geographic divisions. Relative to their population, the Southern States had more trainees in each professional category, but they emphasized medical and sanitation personnel to a comparatively greater extent than was true for the country as a whole. In this region, 23.7 and 22.4 percent of the trainees were physicians and sanitation workers, whereas the corresponding percentages for all States and Territories combined were 18.4 and 17.2, respectively. On the other hand, in the Northeastern and Central States, which trained the smallest number of persons

[9] The geographic regions with the States contained therein are as follows:

Northeastern. Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia.

Southern: Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

Central: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Western: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

The Territories include: Alaska, Hawaii, Puerto Rico, and Virgin Islands.

relative to their populations, larger than average proportions were found in the nursing and "other" groups. The West was characterized by the highest percentage of nurses found in any section, 64.3 as compared with 55.0 for all areas combined. Trainees from the Territories, especially Puerto Rico, more frequently than those from the States were in the "sanitation" or "other" categories.

Comparisons among individual States, as might be expected, reveal greater differences in emphasis on one or another of the several professional categories. For example, the representation of physicians among all trainees from a State ranged from 1.6 percent in Montana to 47 1 percent in Alabama. Conversely, the percentage of Montana's trainees who were nurses was 95 2, in contrast to 22.2 for Alabama and 18.3 for Puerto Rico. On the continent, sanitation training was most emphasized in West Virginia where 39.0 percent of all persons included under the program fell into that category. Still higher proportions, 44.4 and 41.9 percent respectively, of Hawaiian and Puerto Rican trainees were sanitation workers. Personnel outside the medical, nursing, and sanitation fields made up 50.9 percent of all those trained in North Dakota. That this proportion was exceptionally high is indicated by the corresponding percentage for all States and Territories, 9.4. One brief course in vital statistics, provided for clerks who were to carry on that activity in various parts of the State, made up the training received by a majority of these "other" workers in North Dakota.

Difference in performance among the States in respect to training programs may have been influenced partially by conditions associated with differences in their income status and urban character. These factors were on the whole inversely related to number of persons trained per 100,000 population. The general tendency of the poorer States to provide instruction for larger number of workers in proportion to total population may be illustrated by dividing the 48 States into 4 groups of 12 each on the basis of trainee ratios and ranking the States in each group by average per capita incomes.[10] If the median income States are then selected from each group, the following results are obtained. The 12 States with the lowest ratios of trainees show a median per capita income of $679 in 1940; the next 12 States, $531; the third group, $416; and the fourth, comprising the States with the highest ratio of trainees, $362.

A similar comparison made with the purpose of discovering the relationship between number of trainees and population density of States reveals an even more striking pattern. For the 12 States having the lowest ratio of trainees, selection of the median indicates an

[10] Average per capita income payments in 1940 to all individuals (excluding payments outside the continental United States), as reported by Charles F Schwartz, U. S. Department of Commerce, in table 2, "State Income Payments in 1944." Survey of Current Business 25:10-19 (August 1945).

average of 194 persons per square mile; for the next group of States, 50; while for the two groups having higher than average trainee ratios, the median number of persons per square mile falls to 26 and 24, respectively.

Summary

Expenditures for personnel training by the States and Territories in connection with grant-in-aid programs are briefly presented as one measure of the extent of such activities from 1936 to 1944.

A somewhat detailed analysis is made of 8,414 individual records submitted for persons whose training during the same period was aided by Title VI or venereal disease control funds administered by the United States Public Health Service through the State and Territorial health departments. More than half of these people were nurses. Physicians and, to a lesser extent, nurses were included in greater proportions than they represented on the staffs of health agencies. The median age of all trainees was 31.

Among the types of instruction received were: Observation courses, supervised experience, short institutes, and formal classes. About 80 percent of all training periods consisted at least partially of academic instruction; 58 percent lasted for 3 months or longer. Field practice and courses of short duration, however, made up increasing proportions of training during the war years.

Participants in the program attended 80 different educational institutions. Eighty-seven percent, however, were concentrated in 17 colleges and universities. A large majority of trainees in each professional category and almost all of the nurses and physicians selected schools which during at least part of the study period offered programs of graduate study in public health of an apparently appropriate type.

There were wide differences in the extent to which the several States took part in the training program and in their emphasis on various categories of personnel. Generally speaking, the States training the largest number of workers in proportion to their total populations were comparatively poor or thinly settled or both. They were more likely to be in the South or West than in the Northern or Eastern sections of the country.

In the early years of the program and again during the war, plans for developing well-trained staffs were greatly hampered by the acute and immediate need of workers. Short orientation courses received an emphasis not originally anticipated. Now, with comparatively normal employment conditions but ever-increasing demands for health services in prospect, more careful consideration can be given to planning well-rounded training programs.

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Appendix A

TABLE A.—*Total expenditures for training* [1] *by State and Territorial health departments, as reported to the United States Public Health Service, according to fiscal year (1936–44)*

State or Territory	Expenditures in designated fiscal years									
	Total, all years	1936	1937	1938	1939	1940	1941	1942	1943	1944
United States and Territories	$9,842,718	$323,749	$1,209,569	$1,420,188	$1,248,162	$1,163,566	$1,433,726	$1,315,747	$876,072	$851,939
Alabama	330,697	11,246	26,485	47,776	37,729	44,407	46,426	59,618	36,805	20,145
Arizona	62,142	7,322	13,502	8,912	3,341	18,791	8,402	1,621		251
Arkansas	174,735	5,231	28,142	26,144	33,908	27,946	33,936	11,201	5,700	2,524
California	410,396	2,738	54,969	69,818	63,660	41,818	68,194	50,374	23,171	26,654
Colorado	83,519	10,848	18,405	11,287	20,153	8,219	3,802	8,334	311	2,010
Connecticut	64,114	1,223	13,774	14,213	11,218	8,408	12,611	425		2,212
Delaware	19,822	922	2,903	2,563	1,042	2,827		2,786	4,167	2,012
District of Columbia	88,250	512	6,615	14,070	11,496	9,271	8,057	9,123	16,103	13,033
Florida	113,349	11,773	25,110	13,337	9,914	10,352	17,458	15,922	3,039	6,444
Georgia	425,493	9,027	53,995	60,228	55,771	59,296	84,290	50,051	28,928	23,904
Idaho	73,960	4,159	9,174	13,217	11,038	6,290	8,288	7,044	8,164	6,586
Illinois	235,718	9,246	23,167	22,597	37,141	30,919	28,659	23,489	28,135	32,365
Indiana	134,350	1,543	16,103	20,358	22,118	19,230	21,794	16,137	8,308	8,705
Iowa	143,475	4,791	32,823	15,638	16,788	20,810	22,210	22,060	4,899	3,456
Kansas	99,097	4,270	17,326	14,348	18,360	14,342	9,076	10,205	5,060	6,011
Kentucky	151,511	8,638	34,021	25,412	20,486	24,610	20,981	6,091	2,751	2,488
Louisiana	191,786	3,268	13,040	18,163	14,778	22,216	39,219	31,693	22,575	26,834
Maine	39,858	2,576	9,303	13,015	4,756	2,075		3,107	2,592	2,434
Maryland	312,108	4,855	26,004	26,504	24,176	46,363	44,000	48,570	45,860	45,776
Massachusetts	225,294	2,381	37,428	45,065	42,776	34,799	35,649	15,133	10,173	1,890
Michigan	905,329	14,124	48,101	48,994	43,601	95,412	100,801	216,266	208,320	219,710
Minnesota	288,630	12,784	65,328	37,859	33,636	26,475	34,398	32,889	28,051	17,210
Mississippi	265,644	14,511	23,391	22,204	18,381	37,521	45,438	43,505	39,204	21,489
Missouri	198,172	3,878	26,949	26,505	32,877	13,773	44,177	26,441	12,254	11,318
Montana	33,937	3,010	4,340	2,491	6,761	5,095	4,120	3,689	2,212	2,219
Nebraska	63,151	430	9,136	11,647	5,909	7,058	8,796	13,372	4,648	2,155
Nevada	28,435	1,965	6,132	7,393	3,423	4,237	2,871	1,883	431	100
New Hampshire	28,124	2,079		6,805	6,720	4,838	7,188	380	114	
New Jersey	81,829		14,878	15,042	13,935	9,411	12,265	5,360	6,826	4,103
New Mexico	86,781	10,858	11,316	24,364	9,825	8,708	10,683	5,704	4,739	584

New York	845,974	14,860	71,026	192,716	108,932	83,768	121,465	102,329	69,113	81,705
North Carolina	631,227	13,988	70,489	68,439	53,131	94,581	91,073	102,529	70,536	66,461
North Dakota	74,044	2,097	7,220	6,414	6,340	10,756	5,277	12,615	11,094	12,231
Ohio	236,819	6,397	32,400	130,383	28,089	8,936	15,041	11,816	1,874	1,883
Oklahoma	183,825	3,267	21,866	33,464	31,465	16,352	25,730	21,751	13,636	16,291
Oregon	100,718	7,270	8,256	16,956	14,274	16,691	26,033	5,295	3,401	2,542
Pennsylvania	345,255	1,663	41,213	21,812	27,247	74,251	90,022	46,944	25,490	13,608
Rhode Island	32,741	7,395	6,522	8,258	3,444	2,054	128	2,817	635	1,488
South Carolina	184,322	22,482	34,276	25,936	29,040	6,967	20,339	18,156	14,519	12,607
South Dakota	66,497	3,274	10,466	9,807	12,938	6,323	9,020	6,183	6,429	2,061
Tennessee	339,943	8,846	38,055	61,737	43,761	40,049	57,937	56,402	22,153	10,043
Texas	369,573	11,502	58,190	43,553	70,090	48,092	48,531	38,355	29,906	21,345
Utah	84,060	7,398	23,032	9,330	5,598	10,392	7,933	13,259	6,263	855
Vermont	14,020	125	1,617	3,279	2,078	1,843	3,655	185	440	798
Virginia	124,236	8,212	21,157	17,320	20,183	21,348	21,962	8,192	1,412	4,450
Washington	90,761	4,756	11,555	21,464	20,838	10,409	10,048	6,712	1,903	2,476
West Virginia	226,536	14,403	42,746	31,199	87,831	14,897	12,200	10,646	6,324	6,290
Wisconsin	100,450	6,659	13,284	10,772	24,584	12,097	10,395	12,167	8,372	2,120
Wyoming	26,022	4,491	4,630	2,404	3,922	1,261	1,531	3,377	2,619	1,727
Alaska	19,770	356	3,735	5,024	6,146	1,452		2,874		183
Hawaii	71,253	4,095	15,014	10,892	5,905	14,673	12,691	4,573	1,860	1,550
Puerto Rico	224,930					767	58,200	76,929	14,541	74,493

[1] All amounts, regardless of source, reported by the State or Territorial health department as expended for training, including subsidies to schools and field orientation centers as well as direct assistance to trainees, are included.

TABLE B.—*Distribution of trainees [1] at different schools by type of training (1936–44)*

School from which training was received	Number of trainees who received training of designated type		
	Total, all types	Academic study [2]	Field practice
All trainees	[3] 8,357	6,674	1,683
No school	1,511		1,511
California, University of	394	380	14
Catholic University of America	10	10	
Chicago, University of	21	21	
Columbia University or DeLamar Institute	305	304	1
Duke University	10	10	
Duquesne University	34	34	
George Peabody College for Teachers	703	691	12
Harvard University	219	215	4
Indiana University	47	44	3
Johns Hopkins University	302	288	14
Kentucky, University of	251	250	1
Louisiana State University	37	37	
Loyola University, Chicago	12	9	3
Massachusetts Institute of Technology	52	52	
Medical College of Virginia	78	78	
Michigan State College	13		13
Michigan, University of	774	710	64
Minnesota, University of	653	641	12
Murray State Teachers College	10	10	
New York University	117	116	1
North Carolina, University of	387	385	2
Oregon, University of	175	174	1
Pennsylvania, University of	467	465	2
Pittsburgh, University of	75	75	
Richmond School of Public Health, Professional Institute, College of William and Mary	138	132	6
St. John's University, Brooklyn	16	16	
St. Louis University	148	146	2
School of Tropical Medicine, Puerto Rico	80	80	
Simmons College	89	88	1
Syracuse University	169	169	
Temple University	12	12	
Tennessee, University of	17	17	
Tulane University	14	14	
Vanderbilt University	590	586	4
Washington, University of	172	169	3
Wayne University	19	19	
Western Reserve University	89	86	3
Wisconsin, University of	12	11	1
Yale University	34	34	
Other	101	96	5

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.

[2] Including instances when both academic and field training were covered in the same application.

[3] Not included in this total are 57 trainees for whom type of training or the school at which it was received are unknown.

Table C.—*Distribution of trainees[1] with academic study at different schools by fiscal year (1936–44)*

School from which training was received	Total, all years	1936	1937	1938	1939	1940	1941	1942	1943	1944	Unknown years[2]
		Number of trainees receiving training initiated in designated fiscal year									
All trainees	6,674	439	649	1,306	659	719	1,052	601	531	611	107
California, University of	380	54	9	65	43	19	46	41	32	58	13
Catholic University of America	10	------	------	1	1	2	2	3	1	------	------
Chicago, University of	21	------	------	2	1	1	5	5	5	2	------
Columbia University or De-Lamar Institute	304	22	22	90	11	28	71	18	17	21	4
Duke University	10	------	------	10	------	------	------	------	------	------	------
Duquesne University	34	------	15	15	------	------	------	------	------	4	------
George Peabody College for Teachers	691	116	108	156	77	58	85	32	15	27	17
Harvard University	215	1	16	38	41	33	60	17	3	2	4
Indiana University	44	------	------	2	1	14	1	13	7	6	------
Johns Hopkins University	288	2	26	65	40	48	56	27	12	5	7
Kentucky, University of	250	30	21	71	69	56	1	------	1	------	1
Louisiana State University	37	------	------	1	15	21	------	------	------	------	------
Loyola University, Chicago	9	------	------	------	------	------	------	2	3	4	------
Massachusetts Institute of Technology	52	------	2	10	6	8	13	6	3	------	4
Medical College of Virginia	78	15	14	27	5	4	6	3	3	------	1
Michigan, University of	710	46	120	164	60	56	119	80	35	25	5
Minnesota, University of	641	90	114	76	52	36	74	61	59	77	2
Murray State Teachers College	10	------	------	------	------	------	------	------	------	10	------
New York University	116	1	2	15	------	7	51	15	10	15	------
North Carolina, University of	385	------	------	78	16	23	51	55	82	46	34
Oregon, University of	174	19	25	28	25	25	19	20	7	6	------
Pennsylvania, University of	465	1	24	40	14	80	117	43	55	88	3
Pittsburgh, University of	75	------	------	------	------	------	------	------	------	75	------
Richmond School of Public Health, Professional Institute, College of William and Mary	132	4	20	27	14	25	19	14	2	1	6
St. John's University, Brooklyn	16	------	------	------	------	------	10	6	------	------	------
St. Louis University	146	------	------	------	1	------	3	15	78	49	------
School of Tropical Medicine, Puerto Rico	80	------	------	------	------	------	25	10	29	16	------
Simmons College	88	1	6	43	2	4	21	4	3	4	------
Syracuse University	169	------	23	82	------	6	19	3	30	6	------
Temple University	12	------	------	4	2	------	4	------	------	------	2
Tennessee, University of	17	------	------	------	13	2	2	------	------	------	------
Tulane University	14	------	------	------	------	1	------	------	------	13	------
Vanderbilt University	586	15	44	117	122	120	105	46	5	11	1
Washington, University of	169	13	25	37	18	8	24	27	6	9	2
Wayne University	19	------	2	3	1	4	4	5	------	------	------
Western Reserve University	86	9	8	20	2	7	12	7	10	11	------
Wisconsin, University of	11	------	------	------	------	------	------	5	6	------	------
Yale University	34	------	1	6	1	15	4	3	1	3	------
Other	96	------	2	13	6	8	23	15	11	17	1

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.

[2] All training for which the year of onset is unknown occured in the early years of the program.

TABLE D.—*Distribution of trainees*[1] *with academic study at different schools by professional category (1936–44)*

School from which training was received	Number of trainees in designated professional category				
	Total, all categories	Medical	Nursing	Sanitation	Other[2]
All trainees	6,674	1,049	4,032	975	618
California, University of	380	56	197	90	37
Catholic University of America	10		10		
Chicago, University of	21		12	2	7
Columbia University or DeLamar Institute	304	15	281		8
Duke University	10				10
Duquesne University	34		34		
George Peabody College for Teachers	691		691		
Harvard University	215	93	7	83	32
Indiana University	44		44		
Johns Hopkins University	288	209	23	4	52
Kentucky, University of	250	59	158	28	5
Louisiana State University	37	21	14		2
Loyola University, Chicago	9		9		
Massachusetts Institute of Technology	52	1		20	31
Medical College of Virginia	78		78		
Michigan, University of	710	101	389	131	89
Minnesota, University of	641	34	488	76	43
Murray State Teachers College	10				10
New York University	116	21	75	19	1
North Carolina, University of	385	90	118	152	25
Oregon, University of	174		174		
Pennsylvania, University of	465	103	205	66	91
Pittsburgh, University of	75		75		
Richmond School of Public Health, Professional Institute, College of William and Mary	132	1	131		
St. John's University, Brooklyn	16		16		
St. Louis University	146		72		74
School of Tropical Medicine, Puerto Rico	80		15	39	26
Simmons College	88		83		5
Syracuse University	169		169		
Temple University	12	1		3	8
Tennessee, University of	17				17
Tulane University	14	13			1
Vanderbilt University	586	204	130	242	10
Washington, University of	169		168	1	
Wayne University	19		19		
Western Reserve University	86	2	84		
Wisconsin, University of	11		11		
Yale University	34	17	2	5	10
Other	96	8	50	14	24

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.
[2] Including dentists, laboratory personnel of all types, health educators, statisticians, other professional and technical workers, and 5 of unknown type.

TABLE E.—*Total number and distribution by professional category of trainees*[1] *from each State and Territory (1936–44)*

State or Territory	Number of trainees in designated professional category					
	Total, all categories	Total, per 100,000 population[2]	Medical	Nursing	Sanitation	Other[3]
All trainees	8,414	6.3	1,550	4,626	1,447	791
Alabama	414	14.6	195	92	109	18
Arizona	43	8.6	4	34	3	2
Arkansas	253	13.0	52	151	44	6
California	343	5.0	79	133	96	35
Colorado	94	8.4	13	70	10	1
Connecticut	70	4.1	8	43	5	14
Delaware	24	9.0	2	11	1	10
District of Columbia	29	4.4	1	18	8	2
Florida	86	4.5	24	38	14	10
Georgia	229	7.3	68	82	59	20
Idaho	70	13.3	5	46	8	11
Illinois	254	3.2	29	170	7	48
Indiana	181	5.3	15	139	20	7
Iowa	147	5.8	19	109	16	3
Kansas	118	6.6	19	75	16	8
Kentucky	433	15.2	86	259	66	22
Louisiana	298	12.6	64	110	112	12
Maine	28	3.3	3	8	8	9
Maryland	89	4.9	10	74	1	4
Massachusetts	112	2.6	17	48	14	33
Michigan	313	6.0	63	124	96	30
Minnesota	233	8.3	23	146	33	31
Mississippi	340	15.6	120	87	104	29
Missouri	183	4.8	30	103	21	29
Montana	62	11.1	1	59	1	1
Nebraska	87	6.6	10	66	9	2
Nevada	28	25.4	2	17	4	5
New Hampshire	31	6.3	3	20	4	4
New Jersey	93	2.2	34	37	16	6
New Mexico	48	9.0	4	40	2	2
New York	547	4.1	90	430	23	4
North Carolina	458	12.8	44	292	79	43
North Dakota	171	26.6	10	62	12	87
Ohio	104	1.5	9	78	15	2
Oklahoma	208	8.9	36	112	21	39
Oregon	175	16.1	22	142	6	5
Pennsylvania	431	4.4	81	207	65	78
Rhode Island	25	3.5	1	12	3	9
South Carolina	107	5.6	4	79	23	1
South Dakota	57	8.9	6	39	10	2
Tennessee	282	9.7	45	156	53	28
Texas	347	5.4	68	188	71	20
Utah	98	17.8	2	84	5	7
Vermont	21	5.8	7	9	1	4
Virginia	48	1.8	14	26	6	2
Washington	114	6.6	26	71	12	5
West Virginia	136	7.2	44	37	53	2
Wisconsin	170	5.4	17	128	22	3
Wyoming	29	11.6	11	14	3	1
Alaska	20	27.6	1	15	2	2
Hawaii	36	8.5	3	16	16	1
Puerto Rico	93	5.0	6	17	39	31
Virgin Islands	4	16.1		3		1

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.
[2] Number trainees for the fiscal years 1936–44 related to the population according to the 1940 Census.
[3] Including dentists, laboratory personnel of all types, health educators, statisticians, other professional and technical workers, and 5 of unknown type.

TABLE F.—*Distribution of trainees[1] from each State and Territory by fiscal year (1936–44)*

State or Territory	Number of trainees receiving training initiated in designated fiscal year: Total, all years	1936	1937	1938	1939	1940	1941	1942	1943	1944	Unknown year[2]
All trainees	8,414	458	685	1,501	750	857	1,372	935	871	856	129
Alabama	414	12	20	95	45	41	103	66	24	8	...
Arizona	43	7	14	8	3	7	3	...	...	1	...
Arkansas	253	11	15	40	20	43	56	24	26	17	1
California	343	...	5	34	30	46	70	56	37	54	11
Colorado	94	27	9	18	14	2	8	12	1	2	1
Connecticut	70	3	3	24	...	11	24	1	...	4	...
Delaware	24	...	...	4	2	2	...	2	7	2	5
District of Columbia	29	3	1	13	4	1	4	2	...	...	1
Florida	86	16	...	13	...	8	9	21	3	2	14
Georgia	229	8	10	64	...	28	36	13	5	16	49
Idaho	70	9	3	8	13	4	12	9	7	5	...
Illinois	254	1	44	25	5	4	35	35	46	59	...
Indiana	181	1	22	28	15	17	36	26	23	12	1
Iowa	147	9	37	15	7	1	27	24	14	13	...
Kansas	118	4	12	25	13	11	10	19	13	11	...
Kentucky	433	40	17	93	81	80	39	27	19	36	1
Louisiana	298	4	4	13	57	53	18	60	39	49	1
Maine	28	...	1	8	4	2	...	4	2	7	...
Maryland	89	...	6	27	5	6	5	10	11	19	...
Massachusetts	112	1	2	40	1	18	40	2	5	2	1
Michigan	313	35	27	24	3	23	41	45	46	69	...
Minnesota	233	42	48	29	22	15	26	20	16	14	1
Mississippi	340	...	26	71	44	48	53	41	37	20	...
Missouri	183	9	19	33	30	8	41	15	8	16	4
Montana	62	6	2	11	10	7	9	8	3	6	...
Nebraska	87	...	12	19	9	4	23	17	1	2	...
Nevada	28	5	...	6	2	3	3	5	2	...	2
New Hampshire	31	3	2	5	4	2	8	1	...	2	4
New Jersey	98	1	2	35	4	6	21	5	14	5	...
New Mexico	48	9	1	17	7	4	8	2	...	...	...
New York	547	14	38	160	1	38	144	49	55	47	1
North Carolina	458	23	37	76	32	55	55	52	106	22	...
North Dakota	171	7	13	12	...	3	7	15	67	47	...
Ohio	104	6	13	44	1	...	20	15	3	2	...
Oklahoma	208	6	19	31	29	15	17	18	36	37	...
Oregon	175	20	11	22	23	24	23	26	10	15	1
Pennsylvania	431	...	40	28	10	61	85	27	36	144	...
Rhode Island	25	...	...	12	1	4	1	6	...	...	1
South Carolina	107	14	16	24	4	5	13	8	9	1	13
South Dakota	57	6	7	8	7	4	10	9	6	...	...
Tennessee	282	21	28	33	59	38	63	19	12	11	...
Texas	347	12	53	82	50	43	44	23	17	23	...
Utah	98	19	12	9	9	14	8	16	9	2	...
Vermont	21	...	...	8	2	3	5	...	1	2	...
Virginia	48	1	1	11	10	7	12	4	...	...	2
Washington	114	4	4	27	17	11	20	18	6	6	1
West Virginia	136	10	2	29	1	5	23	23	23	9	11
Wisconsin	170	24	21	21	26	14	14	20	18	10	2
Wyoming	29	5	3	1	6	...	2	2	10	...	...
Alaska	20	...	3	9	5	1	...	1	...	1	...
Hawaii	36	...	...	9	3	9	10	2	...	3	...
Puerto Rico	93	...	...	...	...	...	28	10	35	20	...
Virgin Islands	4	...	...	...	...	...	...	...	3	1	...

[1] Persons with tuition, stipends, and/or travel expenses incidental to training paid from funds administered by the U. S. Public Health Service through State and Territorial health departments. This enumeration is based upon application forms; therefore, an individual is counted as many times as there are application forms representing training which he received.

[2] All training for which the year of onset is unknown occurred in the early years of the program.

Appendix B

Form 3019
(Formerly D. F. 290)
(Revised July 1941)

TRAINEE APPLICATION FORM

(Before completing form read instructions on reverse side)

U. S. PUBLIC HEALTH SERVICE, FEDERAL SECURITY AGENCY

CHILDREN'S BUREAU, U. S. DEPARTMENT OF LABOR

I. GENERAL INFORMATION:

Name .... (Surname) .... (First name) .... (Initial) State .... Date .... (Month) (Day) (Year)

Sex .... Color .... Year of birth .... Dependents ☐ (Yes) ☐ (No) Present address .... (Street) .... (Post office)

II. EDUCATIONAL HISTORY:

High school graduate? ☐ (Yes) ☐ (No) If no, circle years completed: 0 1 2 3 Curriculum major ....

	Colleges—Universities—Nursing and Other Training Schools (Give name and location)	Attended		Field of Specialization	If Graduated, Degree Received	If Not Graduated, Give Credit Hours
		Month	Year			
1	....	From .... To		....	....	....
2	....	From .... To		....	....	....
3	....	From .... To		....	....	....
4.	....	From .... To		....	....	....
5	....	From .... To		....	....	....

III. EXPERIENCE:

List in chronological order all positions held within last 10 years, including present position. (See reverse side for additional space.)

	Pay-Roll Title of Position	Name of Employing Agency	Dates of Employment		Full Time (Yes or no)	Number of Persons Supervised, if Any	Salary per Month
			Month	Year			
1.	....	....	From .... To		....	....	$............
2	....	....	From .... To		....	....	$............
3.	....	....	From .... To		....	....	$............
4	....	....	From .... To		....	....	$............

IV. TRAINING PLANNED:

Type of course planned ....

College or university study .... (Name of school) Period of study: From .... (Month) (Day) (Year) To .... (Month) (Day) (Year) Full time ☐ (Yes) ☐ (No)

College accredited field training .... (Name of training center) Period of training: From .... (Month) (Day) (Year) To .... (Month) (Day) (Year) Concurrent with school attendance ☐ (Yes) ☐ (No)

Nonaccredited field practice .... (Name of agency) From .... (Month) (Day) (Year) To .... (Month) (Day) (Year) At .... (County or city)

I agree, upon completion of this training, to accept at least 2 years employment in the field for which I am being trained.

.... (Signature of applicant)

V. BUDGETARY DATA:

Note.—Applicant will not fill the following. This section is to be completed by the State agency.

Source and estimated amount of training funds: Title VI, $ .... V.D., $ .... M C H., $ .... C.C., $ ....

Approximate dates of sponsored training:

From .... (Month) (Day) (Year) To .... (Month) (Day) (Year)

Fiscal Year	Budget No.	Stipend	Tuition	Travel
...	....	Item No. .... Total amt. .... Item No. .... Total amt.	Item No. .... Total amt. .... Item No. .... Total amt.	Item No. .... Total amt. .... Item No. .... Total amt. ....

Applicant is being trained for a State ☐ Local ☐ Reserve ☐ or other position ☐ .... (Give pay-roll title of position)

Application approved by .... (Public Health Service) or (Children's Bureau)

Applicant recommended by .... (Executive officer of State agency)

Date approved ....

Date recommended ....

[OVER]

16—28806

INSTRUCTIONS

Note.—This form has been prepared by the United States Public Health Service in cooperation with the United States Children's Bureau and should be completed by every individual applying for training financed wholly or in part by funds administered by either agency.

Use a typewriter to fill this form if practicable; if not, write or print legibly in ink. Follow instructions carefully, filling in all blanks that apply to your individual case.

Section I.—General Information. It is important that the identity of the applicant be clearly established by an accurate completion of all blanks in this section. Under "dependents" check "yes" only if one or more relatives are entirely dependent on your income for support.

Section II.—Educational History. A complete history of all previous education from high school to the present date is imperative.

In describing your high school education fill in blank designated as "curriculum major" with the appropriate term, such as Academic or Literary, Commercial, Science, Industrial Arts, Home Economics, etc.

In describing post-high school education list all colleges, universities, schools of nursing and other educational institutions in order of attendance.

To describe "Field of Specialization," use appropriate terms such as Sanitary Engineering, History, Maternal and Child Hygiene, Adult Health Education, etc , to designate the academic field of major emphasis.

The number of credit hours should be indicated only when the applicant was not graduated and should be stated in the units used by each individual school and designated as term hours, semester hours, credits, points, etc., as the case may be.

Section III.—Experience. This section refers to all types of employment during the last 10 years. List all such positions in chronological order, giving inclusive dates of employment, the last position recorded being the applicant's present position or, if now unemployed, the last position held. If a position entails supervision of one or more persons, indicate the number of persons supervised. Under "salary per month" indicate only compensation derived from regular full-time employment.

Section IV.—Training Planned. This section refers to the entire continuous period of training planned. Indicate the type of course planned with the appropriate term such as Orthopedic Nursing, Industrial Hygiene, Public Health Administration, Venereal Disease Control, Maternal and Child Health, etc. Give the beginning and ending dates of each type of training you intend to receive before returning to regular employment.

In outlining proposed training, college accredited field training should not be confused with field practice not accredited by an educational institution.

By signing the statement referring to future employment, the applicant agrees to accept such employment, but the agreement does not necessarily obligate the sponsoring agency.

Section V.—Budgetary Data. (State agency, please note carefully.)

This section is not to be completed by the applicant. The sponsoring agency should state the beginning and ending dates of the period of training in which stipend, tuition and travel, or any one or combination of these items, are to be paid from Federal funds. In the appropriate spaces, indicate fiscal year and budget number as well as item numbers and total estimated amounts of stipend, tuition and/or travel. State the pay-roll title of the position which it is anticipated the applicant will occupy on completion of training.

After the executive officer of the State agency has signified his recommendation of the applicant, this application should be forwarded for approval of the proposed sponsored training to the District Director of the Public Health Service or to the Regional Medical Consultant of the Children's Bureau not less than 30 days previous to the beginning date of training.

III. EXPERIENCE—Continued.—If necessary, use this space to list additional positions held within last 10 years.

Pay-Roll Title of Position	Name of Employing Agency	Dates of Employment		Full Time (Yes or No)	Number of Persons Supervised, If Any	Salary per Month
		Month	Year			
		From				
5.		To				$
		From				
6.		To				$
		From				
7.		To				$
		From				
8.		To				$
		From				
9.		To				$
		From				
10		To				$

REMARKS

U. S. GOVERNMENT PRINTING OFFICE 16—[illegible]

DEATHS DURING WEEK ENDED APRIL 27, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 27, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	9,448	9,105
Average for 3 prior years	9,504	
Total deaths, first 17 weeks of year	169,248	162,732
Deaths under 1 year of age	632	571
Average for 3 prior years	619	
Deaths under 1 year of age, first 17 weeks of year	10,342	10,761
Data from industrial insurance companies:		
Policies in force	67,208,187	67,249,729
Number of death claims	12,527	16,240
Death claims per 1,000 policies in force, annual rate	9.7	12.6
Death claims per 1,000 policies, first 17 weeks of year, annual rate	10.9	11.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 4, 1946

Summary

Of the total of 17 cases of smallpox reported for the week, 7 occurred in Washington State (including delayed report of 1 case), 4 in Iowa, and 3 in Indiana. The total to date is 189, the same as for the corresponding period last year. The 5-year (1941–45) median is 395. (See p. 757.)

The incidence of measles declined slightly for the country as a whole, but increases occurred in the New England, Middle Atlantic, East North Central, and East South Central areas. A total of 39,902 cases was reported, as compared with 40,072 last week and a 5-year median of 26,032. An aggregate of 22,079 cases, or 55 percent of the total, occurred in the Middle Atlantic and East North Central areas as compared with 53 percent in the same area last week. The total to date is 419,130, as compared with 54,475 and 454,871, respectively, for the corresponding periods of 1945 and 1944, and a 5-year median of 340,866.

A total of 245 cases of diphtheria was reported, as compared with 313 last week and a 5-year median of 192. The cumulative figure, 6,422, is more than reported for a corresponding period since 1939.

Of the total of 23 cases of poliomyelitis (as compared with 47 last week and a 5-year median of 19), 4 occurred in Florida (last week 14), 3 in California (last week 8). The current total is the same number as reported for the week ended March 16, the lowest incidence for a previous week this year. Since that date 207 cases have been reported, as compared with 219 for the same period last year.

Of the total of 96 cases of meningococcus meningitis (as compared with 126 last week and a 5-year median of 158), New York reported 11, Illinois, Texas, and California 8 each, Pennsylvania 7, and Ohio 6. The cumulative figure is 3,171, as compared with 4,167 for the period last year, which is also the 5-year median.

Deaths recorded for the week in 93 large cities of the United States totaled 8,974, as compared with 9,448 last week, 9,105 and 9,322, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,123. The total to date is 178,222, as compared with 171,652 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended May 4, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945	
NEW ENGLAND												
Maine	5	0	0	------	------	------	213	3	142	3	1	1
New Hampshire	0	0	0	------	------	------	60	------	23	1	0	0
Vermont	2	0	0	------	------	------	25	5	145	0	0	0
Massachusetts	4	9	2	------	------	------	2,743	150	975	1	5	7
Rhode Island	4	0	1	------	27	2	28	11	11	1	1	1
Connecticut	2	2	1	------	3	1	476	110	442	2	2	2
MIDDLE ATLANTIC												
New York	15	16	15	[1] 7	[1] 1	[1] 5	4,757	130	1,624	11	15	19
New Jersey	6	5	4	6	3	4	4,743	57	1,252	3	3	4
Pennsylvania	13	6	8	1	1	1	4,320	408	1,678	7	13	13
EAST NORTH CENTRAL												
Ohio	12	6	8	3	6	9	734	77	591	6	8	8
Indiana	14	3	3	4	13	13	610	33	261	1	2	2
Illinois	4	2	10	2	5	11	1,022	220	719	8	15	15
Michigan [2]	5	3	4	------	3	2	1,913	290	1,067	4	2	2
Wisconsin	2	1	0	27	58	38	3,980	83	1,854	1	1	1
WEST NORTH CENTRAL												
Minnesota	11	3	3	------	------	------	52	15	390	3	3	1
Iowa	7	3	2	------	------	------	281	52	249	1	0	0
Missouri	4	2	2	1	1	1	179	12	282	4	2	3
North Dakota	1	6	1	------	33	27	------	2	31	0	1	0
South Dakota	1	2	0	------	------	------	55	15	23	0	1	1
Nebraska	1	3	3	2	------	3	303	44	157	0	0	0
Kansas	10	13	4	------	------	1	514	43	633	0	2	2
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	66	11	30	0	0	1
Maryland [2]	9	11	4	4	2	6	716	43	403	1	3	8
District of Columbia	0	0	0	------	------	------	384	6	121	0	2	2
Virginia	10	2	4	106	56	143	608	65	452	1	7	7
West Virginia	7	3	5	3	6	14	45	18	102	0	1	2
North Carolina	4	6	6	------	------	3	491	58	543	1	3	3
South Carolina	2	3	2	150	207	229	271	21	141	1	3	3
Georgia	3	2	2	1	2	17	94	6	164	1	0	1
Florida	3	3	2	------	1	4	209	11	221	1	3	3
EAST SOUTH CENTRAL												
Kentucky	2	1	2	3	------	7	762	30	153	4	2	3
Tennessee	3	2	4	13	10	26	237	65	196	3	4	4
Alabama	0	7	5	21	12	22	212	8	198	0	2	3
Mississippi [2]	1	6	5	------	------	------	------	------	------	0	4	4
WEST SOUTH CENTRAL												
Arkansas	1	2	2	21	11	47	208	24	122	2	4	1
Louisiana	4	6	2	------	4	4	84	28	124	0	6	2
Oklahoma	2	6	5	21	164	43	323	42	148	2	2	2
Texas	23	23	23	439	697	511	1,898	328	1,293	8	9	9
MOUNTAIN												
Montana	0	2	2	------	6	5	54	14	81	0	1	0
Idaho	4	1	0	19	2	------	140	13	57	1	0	0
Wyoming	1	0	0	------	------	------	91	7	67	0	0	0
Colorado	4	9	9	1	5	18	446	39	299	0	1	1
New Mexico	4	4	0	1	1	1	117	16	35	0	2	0
Arizona	1	2	1	32	79	56	266	29	98	0	0	0
Utah [2]	0	0	0	2	------	13	388	267	179	0	1	1
Nevada	0	0	0	------	------	------	7	3	16	0	0	0
PACIFIC												
Washington	8	9	2	------	------	------	463	232	307	5	3	2
Oregon	0	4	3	4	6	16	338	99	191	0	3	3
California	26	14	14	15	7	70	3,976	1,267	1,267	8	15	15
Total	245	212	192	909	1,432	1,432	39,902	4,510	26,032	96	158	158
18 weeks	6,422	5,139	5,037	182,740	59,102	72,364	419,130	54,475	340,866	3,171	4,167	4,167

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended May 4, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945		May 4, 1946	May 5, 1945	
NEW ENGLAND												
Maine	0	0	0	18	60	14	0	0	0	1	0	0
New Hampshire	0	0	0	3	29	11	0	0	0	0	0	0
Vermont	1	0	0	6	10	10	0	0	0	0	0	0
Massachusetts	0	1	0	191	309	309	0	0	0	2	0	0
Rhode Island	0	0	0	8	16	16	0	0	0	1	0	0
Connecticut	0	1	0	62	57	76	0	0	0	0	1	1
MIDDLE ATLANTIC												
New York	1	2	1	511	740	553	0	0	0	1	2	4
New Jersey	0	1	0	165	153	153	0	0	0	2	0	0
Pennsylvania	0	0	0	436	508	423	0	0	0	6	3	6
EAST NORTH CENTRAL												
Ohio	0	1	1	305	398	320	1	0	0	4	5	4
Indiana	0	1	0	73	94	94	3	9	4	0	0	0
Illinois	0	0	0	198	279	279	0	0	0	1	8	4
Michigan [2]	0	0	0	176	269	224	0	0	0	1	1	1
Wisconsin	0	0	0	101	193	193	1	0	1	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	1	0	44	72	72	0	0	0	0	0	0
Iowa	1	1	0	61	28	40	4	0	1	0	0	0
Missouri	2	0	0	22	53	91	0	0	0	0	0	0
North Dakota	0	0	0	9	19	17	0	0	0	0	0	0
South Dakota	0	0	0	7	19	19	0	1	1	0	0	0
Nebraska	0	0	0	27	94	29	0	0	0	0	0	0
Kansas	0	0	1	71	74	46	0	0	0	0	1	0
SOUTH ATLANTIC												
Delaware	0	0	0	4	5	17	0	0	0	1	0	0
Maryland [2]	0	0	0	78	144	136	0	0	0	3	1	1
District of Columbia	0	0	0	13	27	22	0	0	0	0	1	1
Virginia	1	1	0	61	93	39	0	0	0	0	1	1
West Virginia	0	0	0	22	48	46	0	0	0	0	1	1
North Carolina	1	1	0	44	57	35	0	0	0	1	2	2
South Carolina	0	0	0	6	6	4	0	0	0	0	2	2
Georgia	1	1	0	9	28	15	0	0	0	5	2	2
Florida	4	8	0	6	3	3	0	0	0	0	2	3
EAST SOUTH CENTRAL												
Kentucky	0	1	0	25	32	65	0	0	0	0	1	1
Tennessee	0	1	0	29	41	41	0	0	0	1	2	2
Alabama	0	2	0	7	13	12	0	0	0	0	1	2
Mississippi [2]	0	0	0	2	12	5	0	0	1	3	1	1
WEST SOUTH CENTRAL												
Arkansas	*0	0	0	20	11	5	0	0	0	2	3	2
Louisiana	1	3	0	7	6	6	0	3	0	0	2	2
Oklahoma	0	0	0	8	24	24	0	0	0	1	0	0
Texas	2	6	3	34	82	57	0	0	2	6	9	6
MOUNTAIN												
Montana	0	0	0	10	17	21	1	0	0	0	1	0
Idaho	0	0	0	8	31	31	0	0	0	1	1	0
Wyoming	0	0	0	12	45	16	0	0	0	0	0	0
Colorado	2	0	0	19	48	48	0	0	0	0	0	0
New Mexico	1	0	0	9	26	6	0	1	0	1	0	0
Arizona	1	0	0	14	67	9	0	0	0	0	0	0
Utah [2]	0	0	0	22	22	22	0	0	0	0	0	0
Nevada	0	0	0	2	0	0	0	0	0	0	0	0
PACIFIC												
Washington	1	0	0	20	95	37	7	0	0	0	0	0
Oregon	0	0	0	43	23	18	0	0	0	5	0	0
California	3	3	3	197	335	174	0	0	0	3	0	4
Total	23	36	19	3,225	4,815	3,859	17	14	17	52	54	67
18 weeks	*673	616	414	63,145	98,760	71,761	[4] 189	189	395	897	1,049	1,290

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately as follows: Rhode Island 1; New Jersey 1; Ohio 1; Georgia 4; Tennessee 1; California 2.
[4] Correction by delayed reports of 5 cases in Washington State.
*Correction: Week ended Apr. 13, Arkansas, poliomyelitis 1 case (instead of 2).

Telegraphic morbidity reports from State health officers for the week ended May 4, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended May 4, 1946							
	Week ended—		Median 1941–45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	May 4, 1946	May 5, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	36	52	32	------	------	------	1	------	------	------	1
New Hampshire	5	------	3	------	------	------	------	------	------	------	------
Vermont	43	25	12	------	------	------	------	------	------	------	2
Massachusetts	135	166	166	------	2	------	------	------	------	------	------
Rhode Island	13	18	18	------	------	------	------	------	------	------	------
Connecticut	52	29	29	------	------	------	------	------	------	------	3
MIDDLE ATLANTIC											
New York	135	278	285	4	6	------	3	------	------	1	4
New Jersey	132	104	116	2	------	1	------	------	------	------	2
Pennsylvania	102	212	212	------	------	------	1	------	------	------	1
EAST NORTH CENTRAL											
Ohio	98	159	159	------	------	------	------	------	------	------	2
Indiana	28	21	42	------	------	------	------	------	------	------	------
Illinois	99	41	91	4	------	------	1	1	------	------	9
Michigan [2]	132	98	139	1	1	------	------	------	------	------	2
Wisconsin	85	54	94	------	------	------	------	------	------	------	8
WEST NORTH CENTRAL											
Minnesota	9	7	20	------	------	------	------	------	1	------	3
Iowa	20	2	18	------	------	------	1	------	------	------	1
Missouri	8	25	22	------	------	2	------	------	------	------	1
North Dakota	1	11	13	------	------	------	------	------	------	------	------
South Dakota	------	------	1	------	------	------	------	------	------	------	2
Nebraska	2	5	8	------	------	------	------	------	------	------	------
Kansas	25	36	44	------	------	------	------	------	------	------	17
SOUTH ATLANTIC											
Delaware	4	1	1	------	------	------	------	2	------	------	------
Maryland [2]	24	73	73	------	------	1	2	2	------	------	6
District of Columbia	12	3	12	------	------	------	------	------	------	------	------
Virginia	36	55	63	------	------	26	------	------	3	------	3
West Virginia	32	20	31	------	------	------	------	------	------	------	------
North Carolina	95	186	186	2	------	------	------	1	------	1	1
South Carolina	31	68	68	------	7	------	------	------	------	1	------
Georgia	18	11	14	------	3	------	------	------	------	9	10
Florida	16	13	42	1	------	------	------	------	------	5	1
EAST SOUTH CENTRAL											
Kentucky	22	27	75	------	------	1	------	------	1	------	------
Tennessee	33	19	42	1	1	------	2	------	3	------	4
Alabama	25	8	44	------	------	------	------	------	------	7	2
Mississippi [2]	------	------	------	------	------	------	------	------	2	1	------
WEST SOUTH CENTRAL											
Arkansas	6	14	16	------	------	------	------	------	2	1	1
Louisiana	39	10	3	------	------	------	------	------	1	5	------
Oklahoma	14	17	33	------	------	------	------	------	------	------	------
Texas	196	270	347	6	297	41	------	------	------	14	20
MOUNTAIN											
Montana	4	5	15	------	------	------	------	1	------	------	------
Idaho	14	9	4	------	------	------	------	------	1	------	------
Wyoming	2	8	3	1	------	------	------	------	------	------	------
Colorado	35	34	34	------	------	------	------	1	------	------	1
New Mexico	9	24	7	------	------	------	------	------	------	------	------
Arizona	9	27	27	------	------	57	1	------	------	------	1
Utah [2]	36	44	48	------	------	------	------	------	------	------	------
Nevada	------	------	3	------	------	------	------	------	------	------	------
PACIFIC											
Washington	48	17	46	------	------	------	------	------	------	------	1
Oregon	18	27	19	------	------	------	------	------	------	------	1
California	135	313	313	4	5	------	------	------	------	------	2
Total	2,073	2,646	3,977	26	322	129	11	8	14	45	112
Same week, 1945	2,646	------	------	48	285	109	6	6	9	53	72
Average, 1943–45	2,951	------	------	30	261	86	12	[5] 9	8	[5] 28	------
18 weeks: 1946	33,035	------	------	669	5,261	1,868	163	29	329	827	1,463
1945	44,726	------	------	530	7,748	2,085	120	22	294	874	1,538
Average, 1943–45	49,968	------	[5] 69,361	510	5,067	1,382	175	[5] 38	255	[5] 722	------

[2] Period ended earlier than Saturday.
[5] 5-year median, 1941–45.

Leprosy: California 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 27, 1946

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	1	0	2	0	6	0	0	7
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	1	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	2	0	------	1	426	0	10	0	49	0	0	13
Fall River	0	0	------	0	87	0	2	0	4	0	0	1
Springfield	0	0	------	0	55	0	0	1	4	0	1	1
Worcester	0	0	------	0	314	1	5	0	5	0	0	47
Rhode Island:												
Providence	1	0	------	0	9	1	3	0	8	0	0	5
Connecticut:												
Bridgeport	0	0	------	0	2	0	4	0	4	0	0	------
Hartford	0	0	------	0	5	0	0	0	2	0	0	9
New Haven	1	0	------	0	112	0	1	0	2	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	4	0	------	1	155	0	7	0	10	0	0	11
New York	13	1	------	1	1,581	9	62	1	397	0	1	22
Rochester	0	0	------	0	257	0	5	0	14	0	0	------
Syracuse	0	0	------	0	24	0	3	0	15	0	0	2
New Jersey:												
Camden	1	0	1	1	52	0	1	0	4	0	0	3
Newark	0	0	1	0	881	1	5	0	13	0	0	15
Trenton	0	0	------	0	23	0	4	0	1	0	0	3
Pennsylvania:												
Philadelphia	3	0	2	1	599	2	25	0	62	0	1	14
Pittsburgh	2	0	1	1	14	3	6	1	25	0	0	10
Reading	0	0	------	1	55	0	3	0	4	0	0	14
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	1	50	1	7	0	10	0	0	7
Cleveland	1	0	3	0	132	0	8	0	20	0	0	20
Columbus	2	0	------	0	1	0	4	0	7	0	0	2
Indiana:												
Fort Wayne	0	0	------	0	------	0	0	0	5	0	0	------
Indianapolis	6	0	------	0	259	0	6	0	17	0	0	17
South Bend	0	0	------	0	5	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	3	0	2	0	1	0	0	------
Illinois:												
Chicago	0	0	------	1	399	3	31	0	92	0	0	44
Springfield	0	0	------	0	28	0	0	0	1	0	0	------
Michigan:												
Detroit	0	2	------	0	484	0	11	0	30	0	0	30
Flint	0	0	------	0	8	0	5	0	2		0	------
Grand Rapids	0	0	------	0	213	0	0	0	5	0	0	14
Wisconsin:												
Kenosha	0	0	------	0	109	0	0	0	2	0	0	------
Milwaukee	2	0	------	0	1,882	1	2	0	23	0	0	45
Racine	0	0	------	0	36	0	0	0	2	0	0	------
Superior	0	0	------	0	1	0	0	0	1	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	10	0	1	0	6	0	0	4
Minneapolis	6	0	------	0	21	2	4	0	12	0	1	------
St. Paul	1	1	------	0	3	0	2	0	10	0	0	5
Missouri:												
Kansas City	0	0	1	0	19	0	6	0	7	0	0	------
St. Joseph	0	0	------	0	1	0	0	0	3	0	0	------
St. Louis	2	0	------	1	121	1	4	0	15	0	0	2

City reports for week ended Apr. 27, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	0	------	0	65	0	1	0	6	0	0	------
Kansas:												
Topeka	0	0	------	0	9	0	0	0	5	0	0	7
Wichita	0	0	------	0	96	0	1	0	3	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	30	0	1	0	1	0	0	1
Maryland:												
Baltimore	20	0	2	2	466	2	10	0	26	0	0	9
Cumberland	0	0	------	0	1	0	0	0	2	0	0	------
Frederick	0	0	------	0	------	0	1	0	0	0	0	------
District of Columbia:												
Washington	1	0	------	0	427	2	3	0	26	0	1	7
Virginia:												
Lynchburg	0	0	------	0	18	0	1	0	2	0	0	1
Richmond	1	0	25	0	42	0	1	0	5	0	0	6
Roanoke	0	0	------	0	5	0	0	0	2	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	1	0	0	------
Wheeling	1	0	------	0	4	0	1	0	0	0	0	14
North Carolina:												
Raleigh	0	0	------	0	52	0	0	0	1	0	0	4
Wilmington	0	0	------	0	17	0	1	0	0	0	0	1
Winston-Salem	0	0	------	0	26	0	1	0	2	0	0	1
South Carolina:												
Charleston	0	0	2	0	6	0	1	0	4	0	1	1
Georgia:												
Atlanta	0	0	1	1	14	0	1	0	5	0	0	------
Brunswick	0	0	------	0	3	0	0	0	0	0	0	1
Savannah	0	0	------	0	2	0	0	0	1	0	0	------
Florida:												
Tampa	1	0	------	0	26	0	0	0	0	0	1	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	4	26	0	12	0	2	0	0	5
Nashville	0	0	------	0	3	0	6	0	1	0	0	------
Alabama:												
Birmingham	0	0	2	0	18	0	1	0	0	0	0	------
Mobile	0	0	3	0	3	0	1	1	0	0	0	2
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	1	22	0	2	0	0	0	0	------
Louisiana:												
New Orleans	3	0	1	0	17	0	3	0	2	0	0	------
Shreveport	0	0	------	0	0	0	7	0	0	0	0	------
Texas:												
Dallas	0	0	------	0	68	1	1	0	2	0	0	3
Galveston	0	0	------	0	5	0	0	0	0	0	3	------
Houston	2	0	1	0	4	0	4	0	0	0	1	------
San Antonio	1	0	------	0	14	0	1	0	1	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	1	0	2	0	1	0	0	------
Great Falls	0	0	------	0	------	0	1	0	0	0	0	------
Helena	0	0	------	0	------	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	3	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	3	0	1	0	0	0	0	------
Colorado:												
Denver	1	0	2	1	793	0	2	0	11	0	1	23
Pueblo	0	0	------	0	22	0	1	0	3	0	0	------
Utah:												
Salt Lake City	0	0	------	0	115	0	3	0	5	0	0	11

City reports for week ended Apr. 27, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	2	0	------	0	75	0	2	0	9	2	0	7
Spokane	0	0	------	0	68	0	2	0	0	0	0	3
Tacoma	0	0	------	0	12	0	0	0	1	0	0	2
California:												
Los Angeles	1	0	6	1	485	2	9	1	34	0	2	5
Sacramento	0	0	------	0	329	0	2	0	1	0	0	2
San Francisco	2	0	4	0	178	0	10	0	15	0	1	8
Total	86	4	59	20	12,007	32	341	5	1,083	2	15	492
Corresponding week, 1945	64	------	22	19	1,395	------	331	------	1,540	0	8	724
Average, 1941–45	60	------	84	[1] 26	[2] 6,574	------	[1] 402	------	1,631	0	13	952

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Anthrax.—Cases: Philadelphia 1.
Dysentery, amebic.—Cases: Boston 2; San Antonio 19; Los Angeles 2.
Dysentery, bacillary.—Cases: New York 2; Chicago 1; Memphis 1; Los Angeles 2.
Leprosy.—Cases: San Francisco 1.
Rocky Mountain spotted fever.—Cases: Missoula 1.
Tularemia.—Cases: Lynchburg 1.
Typhus fever, endemic.—Cases: Atlanta 1; Birmingham 1; Mobile 1; Dallas 1; Galveston 1; Houston 2.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 34,366,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	10.5	0.0	0.0	2.6	2,643	5.2	70.6	2.6	222	0.0	2.6	217
Middle Atlantic	10.6	0.5	2.8	2.8	1,685	6.9	56.0	0.9	252	0.0	0.9	44
East North Central	7.9	1.2	1.8	1.2	2,195	3.0	46.2	0.0	134	0.0	0.0	109
West North Central	20.1	2.0	2.0	2.0	694	6.0	38.2	0.0	135	0.0	2.0	38
South Atlantic	39.2	0.0	40.0	4.9	1,862	6.5	36.0	0.0	127	0.0	4.9	75
East South Central	0.0	0.0	29.5	23.6	295	0.0	118.0	5.9	18	0.0	0.0	41
West South Central	17.2	0.0	5.7	2.9	373	2.9	51.7	0.0	14	0.0	11.5	9
Mountain	7.9	0.0	15.9	7.9	7,418	0.0	103.3	0.0	159	0.0	7.9	270
Pacific	7.9	0.0	15.8	1.6	1,814	3.2	39.5	1.6	95	3.2	4.7	43
Total	13.1	0.6	9.0	3.0	1,827	4.9	51.9	0.8	165	0.3	2.3	75

PLAGUE INFECTION IN SANTA BARBARA AND VENTURA COUNTIES, CALIF.

Plague infection has been reported proved, on April 22, in 2 pools of fleas from ground squirrels, *C. beecheyi*, shot in Santa Barbara County, Calif.; 1 a pool of 131 fleas from 3 ground squirrels taken 1 mile south of Buellton, and the other a pool of 198 fleas from 5 ground squirrels taken 1 mile south and one-half mile east of Buellton.

Under date of April 29, plague infection was reported proved, on April 26, in tissue from one cottontail rabbit shot one-half mile south and 2 miles east of Santa Paula, Ventura County, Calif.

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

Week Ended May 4, 1946

No new case reported in San Francisco or in the State. Date of onset of last case was March 27.

Six new cases, with 1 death, were reported in the Seattle area during the week—1 case in King County, 5 cases, 1 death, in Everett (Snohomish County). To May 6, total for the State, 59 cases, 16 deaths—Seattle, 35 cases, 8 deaths; King County, 15 cases, 6 deaths; Everett, 6 cases, 2 deaths; 1 case each in Longview, Waterville, and Orcas Island, the latter being the residence of the patient in the case originally reported from Friday Harbor. Date of onset of last case was May 2, in Everett.

TERRITORIES AND POSSESSIONS

Panama Canal Zone

Notifiable diseases—March 1946.—During the month of March 1946, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	1		1		2		2		6	
Diphtheria	21		1		2		14	1	38	1
Dysentery										
Amebic	4		2		2		2		10	
Bacillary	2	1			1		2		5	1
Leprosy						1				1
Malaria [1]	6	1	3		21		46	7	76	8
Measles	3				18	1	22		43	1
Meningitis, meningococcus					1				1	
Mumps					2		11		13	
Paratyphoid fever							1		1	
Pneumonia		9		4	37	3		6	[2] 37	22
Relapsing fever	1								1	
Tuberculosis		13		9	4	2		7	[2] 4	31
Typhoid fever			1	1					1	1
Whooping cough		2			3			2	[2] 3	4

[1] 16 recurrent cases.
[2] Reported in the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 6, 1946.—During the week ended April 6, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		36		107	232	7	19	22	140	563
Diphtheria		4		23	4	7	4			42
Dysentery, bacillary				1						1
Encephalitis, infectious							1			1
German measles				23	57	4	6	13	16	119
Influenza		10			11	2	1		185	209
Measles		143	9	669	1,321	4	2	105	69	2,322
Meningitis, meningococcus			1		3		2			6
Mumps				37	429	124	20	103	171	884
Scarlet fever		11	2	74	85	12	2	6	15	207
Tuberculosis (all forms)		9	9	109	67	44	17	44	48	347
Typhoid and paratyphoid fever				12	2		2			16
Undulant fever				2	2				1	5
Venereal diseases:										
Gonorrhea		21	14	126	173	47	44	53	82	560
Syphilis		19	6	136	127	17	20	15	24	364
Whooping cough				52	33			8		93

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

Ceylon—Eastern Province—Batticaloa District.—For the period April 1–17, 1946, 3 fatal cases of suspected cholera were reported in Batticaloa District, Eastern Province, Ceylon. All precautionary measures have been taken.

China.—Cholera has been reported in China as follows: Hunan Province, March 1–31, 1946, 1 case; Hupeh Province, February 19–28, 1946, 52 deaths; Kwangtung Province, April 1–30, 1946, 21 cases, 3 deaths. For the city of Canton cholera was reported as follows: January 1–31, 20 cases; February 1–28, 53 cases; March 1–31, 229 cases, 95 deaths. For the first week of April 1946, 164 cases with 43 deaths were reported in Canton.

India—Calcutta.—For the week ended April 13, 1946, 149 cases of cholera with 54 deaths were reported in Calcutta, India.

Plague

British East Africa—Kenya.—During the week ended April 13, 1946, 5 cases of plague were reported in Rift Valley, Kenya, British East Africa.

Burma—Rangoon.—For the week ended March 30, 1946, 8 cases of plague with 7 deaths were reported in Rangoon, Burma.

China.—Plague has been reported in China as follows: Chekiang Province, April 9, 1946, 3 cases; Fukien Province, February 1 to March 6, 1946, 298 deaths; Kwangtung Province, April 4, 1946, 1 case among the soldiers.

Egypt—Alexandria.—For the week ended April 27, 1946, 7 cases of plague were reported in Alexandria, Egypt.

Union of South Africa.—For the week ended April 20, 1946, 1 case of plague was reported in the Union of South Africa, no specific location being given.

Smallpox

Burma—Rangoon.—For the week ended March 30, 1946, 64 cases of smallpox with 35 deaths were reported in Burma, Rangoon.

French Guinea.—For the period April 1–10, 1946, 107 cases of smallpox were reported in French Guinea.

Togo (French).—For the period April 1–10, 1946, 80 cases of smallpox were reported in French Togo.

Typhus Fever

Mexico.—For the month of March 1946, 127 cases of typhus fever were reported in Mexico. States reporting the highest incidence are: Federal District, 23 cases; Mexico, 18; Guanajuato, 16; Nayarit, 11.

Morocco (French).—For the period April 11–20, 1946, 204 cases of typhus fever were reported in French Morocco, including cases reported by regions as follows: Agadir and frontier districts, 12; Casablanca, 48; Fez, 43; Marrakech, 35; Meknes, 33; Oujda, 3; Rabat, 30.

Turkey.—For the week ended April 27, 1946, 35 cases of typhus fever were reported in Turkey, including 2 cases in Istanbul, 3 cases in Izmir, 2 cases in Samsun, 4 cases in Sinop, and 4 cases in Zonguldak.

Yellow Fever

Colombia—Caqueta Territory—San Vincente del Caguan—La Danta.—On March 1, 1946, 1 death from yellow fever was reported in La Danta, San Vincente del Caguan, Caqueta Territory, Colombia.

Nigeria—Ibadan.—For the week ended April 20, 1946, 1 case of suspected yellow fever was reported in Ibadan, Nigeria.

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UNITED STATES PUBLIC HEALTH SERVICE

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DIVISION OF PUBLIC HEALTH METHODS

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Public Health Reports

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THE NATURE OF THE SOLUBLE ANTIGEN FROM TYPHUS RICKETTSIAE [1]

By CHARLES C. SHEPARD, *Passed Assistant Surgeon*, and RALPH W. G. WYCKOFF, *Senior Scientist (R), United States Public Health Service*

When a suspension of the rickettsiae responsible for either epidemic or endemic typhus fever is extracted with ether, a "soluble" antigen (*1*) may be liberated which has many of the immunological properties of the organisms themselves. This antigen, whose active principle is small enough to pass the usual bacterial filters, is highly active in the complement-fixation and precipitin reactions (*2*). The epidemic antigen can be used in place of the organisms themselves as an effective preventive vaccine. The electron microscope has been employed to determine the character of the elementary particles in these soluble antigens and to find out how they are derived from the organisms by the ether treatment.

Most of the rickettsial suspensions for these experiments have been prepared from the yolk sacs of chicken embryos diseased with either the Breinl strain of epidemic typhus or the Wilmington strain of endemic typhus. A few observations have been made on endemic typhus rickettsiae from mouse lung and on chick-grown Q fever rickettsiae. Suspensions rich in organisms were prepared by the procedures used for the production of antigen for complement fixation. This was done by freeing diluted, ground yolk sacs from large tissue fragments by a preliminary low-speed centrifugation. The organisms in such a clarified suspension were then sedimented and thus separated from soluble material by a high-speed centrifugation carried out for an hour at 4,000 r. p. m. in an angle centrifuge. Taken up in a limited volume of suspending fluid these rickettsiae have been examined in the electron microscope immediately and after extraction with ether. As usual this extraction was carried out by shaking the suspension with not less than a volume and a half of anesthetic ether. After the mix-

[1] From the Division of Infectious Diseases and the Industrial Hygiene Research Laboratory, National Institute of Health.

ture had stood till there was a separation of phases, the aqueous phase was withdrawn, and the ether removed from it at reduced pressure. The physical characteristics of the extracts prepared in this way depended on whether the ether extraction was made at room temperature or in the cold. If it was done at room temperature, most of the rickettsiae were removed by recentrifugation at high speed without serious loss of antigenically active material. Such an active supernatant is the "soluble" antigen. If, on the other hand, extraction was made in the cold, the antigenic principle remained with the rickettsiae and was thrown down almost quantitatively with them. Electron micrographic study was made: (1) Of suspensions from chicken embryo and mouse lung material after centrifugal purification; (2) of such partially purified suspensions (of chick origin) after cold- and warm-ether extractions; and (3) of soluble antigens prepared, as indicated above, by recentrifugation of warm-ether extracts.

These suspensions were prepared for electron microscopic examination by drying microdrops onto the usual collodion-covered screens which were then washed with distilled water when salts had to be removed and finally were shadowed (*3*) by being covered with suitably thin obliquely deposited films of metal. In most of the present work gold, evaporated in vacuum to a calculated thickness of ca. 8 A, was the shadowing metal. Finished preparations were examined and photographed with an RCA type EMU electron microscope.

A concentrated suspension of typhus, or of Q fever rickettsiae shows the organisms enmeshed in a thin membranous material suggestive of bacterial capsules (figs. 1 and 2). In more dilute suspensions this material is associated with the individual cells (fig. 3). There does not seem to be an observable difference in either cell morphology or in the appearance of this capsular substance between Breinl and Wilmington rickettsiae or between the endemic typhus grown in eggs or in mouse lungs. The cell walls of many bacteria, as seen in the electron microscope, resemble this capsule in being flat, sharply bounded structures surrounding thicker central protoplasm. The present photographs, however, make it clear that while the rickettsial capsule may be attached to individual organisms, it usually does not completely envelop them.

Extraction with ether at room temperature does not alter the appearance of the rickettsiae themselves but it does profoundly affect their capsules. These are more or less completely broken up into shreds and droplets, some of which continue to adhere together and to the cells to which they probably were attached before treatment (fig. 4) while others are also freely distributed as tiny droplets over the surface of the preparation (fig. 5). Centrifugation at 4,000 r. p. m. throws down the rickettsiae from such an extract but leaves the droplets in suspension. A preparation of soluble antigen obtained by such a centrifugation gives electron micrographs (fig. 6) showing nothing but

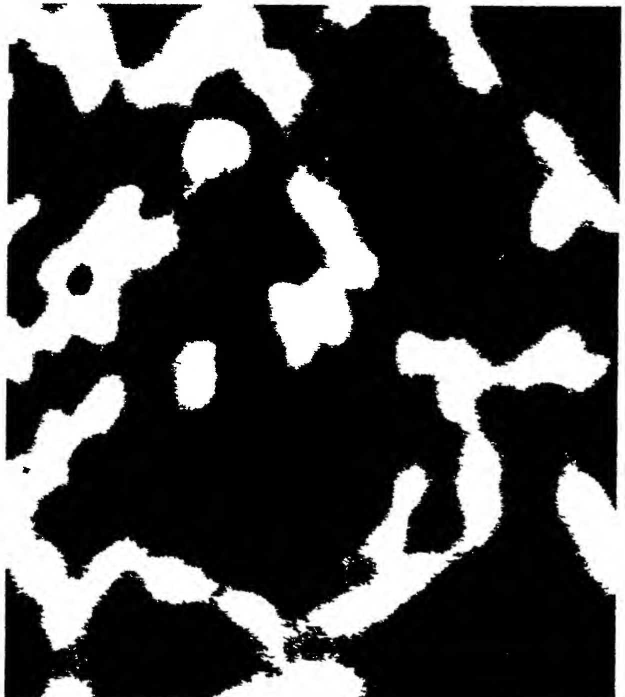

FIGURE 1.—An electron micrograph of a field from a fairly dense suspension of rickettsiae of the Wilmington strain of endemic typhus grown in yolk sac. This and all the following photographs are negative prints. (Magnification as determined by calibration with the replica of an optical grating 18,000 ×.)

FIGURE 2.—A field in a similar Wilmington typhus preparation. The substrate in this instance was formvar; in all others it was collodion. (Magnification 18,000 ×.)

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PLATE II

FIGURE 3.—A field in a more dilute Wilmington typhus preparation This suspension was from infected mouse lung (Magnification, 18,000 ×)

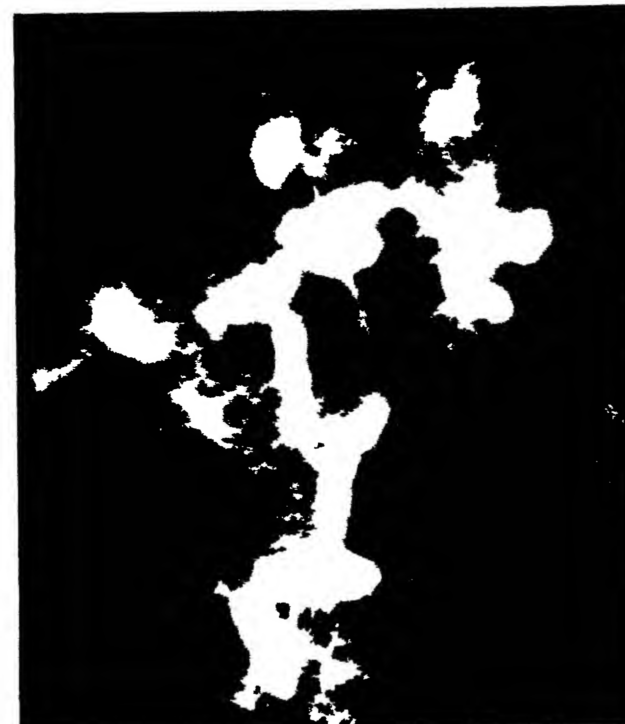

FIGURE 4.—A field from a Breinl typhus preparation, which had been extracted with ether at room temperature The disintegration of the capsular material is evident (Magnification, 18,000 ×)

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PLATE III

FIGURE 5.—A field in another Breinl typhus preparation extracted with warm ether. Many free droplets of soluble antigen are distributed over the substrate. (Magnification, 18,000 X.)

FIGURE 6.—A field in a preparation of Wilmington typhus soluble antigen (Magnification, 18,000 X.)

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PLATE IV

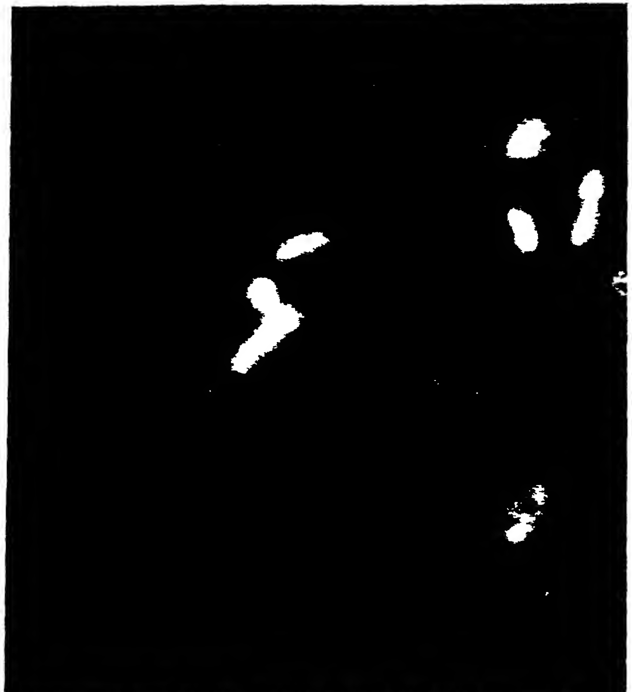

Figure 7.—A field in a breinl typhus preparation extracted with ether in the cold. The beaded beginnings in the break-up of the capsular stuff are especially well shown in this micrograph. (Magnification, 11,000 ×.)

Figure 8.—A field in a preparation that is a mixture of Wilmington typhus soluble antigen and anti-Wilmington typhus rabbit serum. *Most of the droplets of antigen have been agglutinated by the serum.* (Magnification, 18,000 ×.)

these drops, which thus appear as its essential constituent. They are not uniform in size but in the preparations examined their diameters have had such small values that most could pass through bacterial filters.

When the extraction is carried out in the cold, the capsules about many but not all cells are damaged, but this damage rarely has progressed to the point where the droplets have been broken up and liberated into the preparation (fig. 7). This agrees with the fact that very little antigenic activity is associated with the soluble antigen fraction prepared in the cold.

Confirmation of the rickettsial origin of the droplets in preparations of soluble antigen has been obtained by photographing mixtures of the antigen with antirickettsial serum. When typhus rickettsiae are mixed with antityphus rabbit serum, the organisms are specifically agglutinated; the same serum also agglutinates the particles of the corresponding soluble antigen (fig. 8).

SUMMARY

From these observations it would appear that the so-called soluble antigen of typhus, and presumably of other rickettsiae consists of submicroscopic particles of a capsular substance. This substance adheres to and partly envelops the organisms seen in a centrifugally purified rickettsial suspension. It is broken up, and in a sense emulsified, by treatment with warm ether. Micrographs of cold-extracted suspensions show that in them the capsular breakup has begun but has not progressed to the stage of freeing many droplets of the soluble antigen. These droplets are agglutinated by antityphus serum.

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ANTIBACTERIAL ACTION OF PENICILLIN, PENICILLIN X, AND STREPTOMYCIN ON *HEMOPHILUS INFLUENZAE* [1]

By William L. Hewitt, *Senior Assistant Surgeon*, and Margaret Pittman, *Bacteriologist, United States Public Health Service*

The use of crude penicillin by Fleming (*1*) to aid in the isolation of *Hemophilus influenzae* illustrates the relative resistance of this organism to penicillin. Recent reports, however, suggest that *H. influenzae* may at times be somewhat sensitive to the penicillin which is now available. Forgacs, Hutchinson, and Rewell (*2*) reported two type b strains isolated from cases of meningitis which were as sensitive to penicillin as the standard Oxford strain of staphylococcus and concluded that one of their two cases showed some evidence of beneficial response to penicillin. Straker (*3*) reported two strains which appeared to be sensitive to penicillin although their precise sensitivity is not given, it being stated that the circle of inhibition obtained with filter-paper discs was less than half that obtained when a sensitive *Staphylococcus aureus* was employed as a test organism. Several cases of *H. influenzae* meningitis have also been treated with sulfonamides and penicillin by Bonaba et al. (*4*), (*5*), all of which recovered, but it is difficult to conclude what action, if any, the penicillin had in attaining clinical cure; the *in vitro* sensitivity of the cultures isolated from these cases was not reported.

In the present investigation we have studied the penicillin sensitivity of a relatively large number of *H. influenzae* cultures. Streptomycin also was studied because of its greater activity against certain gram-negative bacilli. The activity of these agents was tested both *in vitro* and *in vivo*, also in combination with antiserum and with sulfadiazine. The latter seemed indicated in view of the effectiveness of the combination of antiserum and sulfadiazine in the treatment of experimental *H. influenzae* infections in mice, Pittman (*6*) and Alexander and Leidy (*7*), and of meningeal *H. influenzae* infections in humans, Alexander (*8*) and Sako et al. (*9*).

MATERIALS AND METHODS

Cultures.—Thirty-eight cultures of *H. influenzae* and 2 cultures of *H. parainfluenzae* were used. Of the former, there were 3 type a, 23 type b, 1 type c, 1 type d, 1 type e, 2 type f, and 7 non-type-specific strains. All were isolated from human infections, the majority

[1] From the Division of Infectious Diseases and the Biologics Control Laboratory, National Institute of Health.

being isolated from spinal fluid and a smaller number from the respiratory tract and from the blood. All cultures with the exception of 5 had been maintained since isolation under optimum conditions, that is, in defibrinated blood or in the dried state. The other 5, which will be noted later, had been maintained many years on blood agar slants. The type b cultures used in the *in vivo* tests were all of maximum virulence.

Antibiotics.—The sodium penicillin used was a commercial preparation of about 500 units per milligram, the exact potency of which was assayed against a sample of standard calcium penicillin (370 units per milligram), using *S. aureus* 209 as the test organism. A commercial preparation of penicillin X was used which was designated by the manufacturer as "90 percent or over penicillin X." The potency of this preparation was determined as above. A commercial preparation of streptomycin hydrochloride for parenteral use was standardized against a sample of pure streptomycin hydrochloride of potency of 800 units per milligram, using *Bacillus circulans* as the test organism. Standardized solutions of these antibiotic agents were used in performing the *in vitro* and *in vivo* tests.

Method of testing for antibacterial action in vitro.—The simple fluid medium devised by Stebbins and Robinson (*10*) for the assay of streptomycin supported growth of *H. influenzae* satisfactorily if Fildes' peptic digest of blood (*11*) was added to 1 percent concentration. Peptic digest of blood did not interfere with the assay for potency of penicillin, using *Bacillus subtilis*, or of streptomycin, using *B. circulans.*[2] A simple twofold serial dilution technique similar to that described by Randall et al. (*12*) was employed for determining the sensitivity of the different strains of *H. influenzae*. Serial dilutions of the antibiotic agents were made in 13-mm. test tubes; then each tube was inoculated with a 16–18 hour broth culture; the final dilution of the culture was 1: 100 in a volume of 2 ml. The test tubes were incubated 16 to 18 hours at 37° C., then examined for inhibition of growth, which was clearly defined in all cases.

Method of testing for antibacterial action in mice.—The method of preparing the cultures in a solution of mucin for inoculation into 15–19 gm. white mice was as previously described (*6*). The mice were inoculated in groups of 10 or 20. The antibiotic agents dissolved in physiological saline were administered subcutaneoulsy in 0.5-ml. doses, the initial dose being given approximately 30 minutes before intraperitoneal inoculation of the organisms and subsequent doses at 4-hour intervals. The method of preparation and administration of antiserum and sulfadiazine was similar to that used previously by Pittman (*6*); each was given 1 hour preceding the inoculation of the

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[2] The cultures of *B. subtilis* and *B. circulans* and samples of standard calcium penicillin and streptomycin hydrochloride were kindly furnished by Drs. Wm. A. Randall and C. W. Price of the Food and Drug Administration.

culture. The serum was administered intraperitoneally and the sulfadiazine orally. The infective dose consisted of approximately 100,000 MLD in mucin administered intraperitoneally. The mice were kept under observation for 96 hours. Peritoneal smears and heart's blood cultures were made from mice that died to determine specificity of death and only specific deaths are recorded in the following tables.

EXPERIMENTAL

The sensitivity of 38 cultures of *H. influenzae* and 2 cultures of *H. parainfluenzae* to commercial penicillin (predominantly penicillin G), penicillin X, and streptomycin is presented in table 1. The range of sensitivity to these substances was as follows:

Penicillin .... 0.18–1.5 units per milliliter.
Penicillin X .... 0.05–0.75 units per milliliter.
Streptomycin .... 1.25–10.0 units per milliliter.

TABLE 1.—In vitro *sensitivity of various cultures of* H. influenzae *and* H. parainfluenzae *to penicillin, penicillin X and streptomycin*

Culture No.	Type	Penicillin		Penicillin X		Streptomycin	Pathological source
		Unit	Microgram [1]	Unit	Microgram [1]	Microgram [1]	
H. influenzae:							
571	b	0.18	0.11	0.18	0.18	2.5	Meningitis.
572	b	.37	.24	.05	.05	2.5	Do.
573	b	.18	.11	.18	.18	2.5	Do.
574	b	.37	.24	.18	.18	2.5	Do.
575	b	.75	.45	.18	.18	2.5	Do.
576	b	1.5	.91	.18	.18	5.0	Do.
577	b	.37	.24	.18	.18	2.5	Do.
581	b	.18	.11	.18	.18	2.5	Do.
583	b	.37	.24	.18	.18	2.5	Do.
584	b	.37	.24	.18	.18	2.5	Do.
591	b	.18	.11	.18	.18	1.25	Do.
599	b	.37	.24	.18	.18	2.5	Do.
623	b	.18	.11	.18	.18	2.5	Do.
635	b	.18	.11	.18	.18	1.25	Do.
641	b	.37	.24	.09	.09	2.5	Do.
645	b	.75	.45	.09	.09	5.0	Do.
647	b	.37	.24	.75	.75	1.25	Bacteremia.
649	b	.37	.24	.18	.18	10.0	Meningitis.
650	b	1.5	.91	.37	.37	2.5	Do.
656	b	.75	.45	------	------	5.0	Do.
659	b	.37	.24	.18	.18	5.0	Respiratory infection.
665	b	.37	.24	.18	.18	2.5	Meningitis.
667	b	.37	.24	.18	.18	5.0	Do.
358+	a	1.5	.91	.75	.75	2.5	Respiratory infection.
610	a	.75	.45	.37	.37	5.0	Do.
620	a	1.5	.91	.37	.37	5.0	Meningitis.
624	c	.75	.45	.37	.37	2.5	Respiratory infection.
611	d	.37	.24	.37	.37	5.0	Do.
595	e	1.5	.91	.37	.37	5.0	Not known.
375+	f	.18	.11	.18	.18	2.5	Meningitis.
644	f	1.5	.91	.37	.37	5.0	Do.
51R+	NTS	.18	.11	.09	.09	2.5	Type b meningitis.
525	NTS	.37	.24	.18	.18	5.0	Meningitis.
544+	NTS	.37	.24	.75	.75	2.5	Respiratory infection.
579	NTS	.75	.45	.75	.75	2.5	Eye infection.
596	NTS	.37	.24	.18	.18	2.5	Not known.
640	NTS	.37	.24	.18	.18	2.5	Meningitis.
668	NTS	.37	.24	.18	.18	5.0	Respiratory infection.
H. parainfluenzae:							
535+	------	.37	.24	.18	.18	2.5	Meningitis.
655	------	1.5	.91	.09	.09	2.5	Endocarditis.

[1] Calculated on the basis of [illegible] penicillin G and 1,000 units/mg. for pure penicillin X. 1 microgram of streptomycin hydrochloride = 1 unit.

+ = Culture had been on blood agar slants 6 to 17 years.
NTS = Non-type-specific.

It was noted that the cultures carried on artificial laboratory media for long periods manifested in general the same degree of sensitivity as those strains recently isolated from pathological sources. A graphic presentation of the sensitivity of the various cultures is shown in figure 1. On the unit basis, the cultures as a whole were sensitive to one-half as much penicillin X as penicillin. The majority of both the non-type-specific and the type b cultures had the same sensitivity to the respective antibiotic. There were only seven in the former group;

H. INFLUENZAE — H. PARA-INFLUENZAE

MINIMUM UNIT/MI

PENICILLIN

	a	b	c	d	e	f	nts	H. PARA-INFLUENZAE
150	2*	2			1	1		1
075	1	3	1				1	
037		12		1			5	1
018		6				1	1	

TOTAL NO OF CULTURES TESTED = 40

PENICILLIN X

	a	b	c	d	e	f	nts	H. PARA-INFLUENZAE
075	1	1					2	
037	2	1	1	1	1	1		
018		17				1	4	1
009		2					1	1
005		1						

TOTAL NO OF CULTURES TESTED = 39

STREPTOMYCIN

	a	b	c	d	e	f	nts	H. PARA-INFLUENZAE
10 0		1						
5 0	2	5		1	1	1	2	
2.5	1	14	1			1	5	2
1 25		3						

TOTAL NUMBER OF CULTURES TESTED = 40

*NUMERAL = NO OF CULTURES

FIGURE 1.—Relative sensitivity of *H. influenzae* to penicillin, penicillin X, and streptomycin.

six had been obtained from pathological sources, the source of the seventh is not known. Straker (*3*) reported that the ordinary throat strains of *H. influenzae* are less sensitive to penicillin than the type specific. We did not have any of these throat cultures available for study.

Although no extensive morphological studies were undertaken, Gram's stains of smears made from the first tube showing growth in

the serial dilution tests showed quite definite departure from the normal control. This was most marked in the case of organisms exposed to streptomycin. The majority of the bacteria stained faintly, manifesting almost a shadowy form; a few showed darker staining granules and only an occasional organism appeared normal. In performing the capsular-swelling test with specific antiserum the organisms took the methylene blue stain poorly, a granular appearance was evident, and some of the organisms had a bulbar, club-shaped end. Very few of the organisms showed a distinct capsular swelling. Organisms exposed to penicillin also took the stain faintly, and showed a tendency to form long, thread-like rods, although some normal-appearing cells were present, and a pronounced irregularity in capsular swelling when tested with specific antiserum, yet the latter was not as marked as in the case of organisms exposed to streptomycin.

Results of treatment of mice with penicillin and streptomycin.—In tables 2 and 3 the results of treatment of experimental infections are presented. Culture 572 was relatively susceptible *in vitro* to all three antibiotic agents tested while culture 576 was relatively resistant. The

TABLE 2.—*Results of treatment of mice infected with a strain of* H. influenzae *sensitive* in vitro *to the antibiotic employed*

Therapeutic agent	Dosage				Survival
	25 units 3×	50 units 3×	100 units 3×	200 units 3×	
Penicillin	10D	9D 1S	3D 7S	2D 8S	50-percent end point—257 units.
Penicillin X	8D 2S	2D 8S	5S	9S	50-percent end point—106 units.
Streptomycin	9D	5D 4S	10S	10S	50-percent end point—160 units.
Culture control		10D			None.

Test organism: *H. influenzae* type b No. 572.
D=Mice died.
S=Mice survived.

TABLE 3.—*Results of treatment of mice infected with a strain of* H. influenzae *relatively resistant* in vitro *to the antibiotics employed*

Therapeutic agent	Dosage				Survival
	25 units 3×	50 units 3×	100 units 3×	200 units 3×	
Penicillin	10D	10D	10D	10D	None. No end point obtained.
Penicillin X	10D	10D	1D 9S	10S	50-percent end point—220 units.
Streptomycin	10D	8D 2S	2D 8S	10S	50-percent end point—212 units.
Culture control		10D			None.

Test organism: *H. influenzae* type b No. 571.

amount of therapeutic agent required to protect mice against infections with the resistant strain was considerably greater than when the infection was caused by a sensitive strain. Both strains were shown by virulence controls to be of similar virulence for mice although these data are not presented in the protocols.

The *in vivo* effect of these agents was tested using non-type-specific culture 640 with results which showed streptomycin to afford the greatest protection followed by penicillin X and penicillin in that order. Although this culture was not as virulent for mice as the type b cultures used, the degree of protection obtained followed closely the *in vitro* sensitivity to the antibiotic agents employed in essentially the same manner as the type b cultures.

Influence of streptomycin on invasion of the blood by H. influenzae.—Table 4 presents the effect of streptomycin on the blood cultures of

TABLE 4.—*The fate of bacteria in the blood of mice experimentally infected with* H. influenzae *and treated with varying doses of streptomycin*

oseofstreptomycin	Time of blood culture after treatment	Mouse No.										Results 4 days
		1	2	3	4	5	6	7	8	9	10	
	Hours											
50 units 1×	2	+	±	±	0	±	±	±	±	+	±	
	[illegible]	0	++	±	±	+	++	±	+	++	++	
	[illegible]	+	+++	+	±	+++	+++	++	++	+++	+++	
	[illegible]	D	D	D	D	D	D	D	D	D	D	10D.
100 units 1×	2	±	+	±	+	++	++	+	+	+	0	
	5	±	+	++	±	±	+	+	+	+	0	
	7	+	++	+++	++	++	++	+++	++	++	±	
	24	D	D	D	S	D	D	D	D	D	S	9D; 1S.
200 units 1×	2	0	0	0	0	0	±	+	0	+	0	
	5	0	±	±	±	±	+	±	±	±	+	
	7	±	+	0	+	+	++	++	±	++	++	
	24	S	D	D	D	D	D	D	D	D	D	9D, 1S.
300 units 1×	2	±	0	0	0	±	0	+	0	±	0	
	5	±	±	±	±	0	0	0	±	0	±	
	7	0	0	±	0	0	0	0	0	±	0	
	24	S	S	S	S	S	S	S	S	D	S	3D; 7S.
Control	2	----	±	±	+	±	±	±	±	+	+	
	5	----	++	++	++	++	++	++	±	++	++	
	7	----	+++	+++	+++	+++	+++	+++	+++	+++	+++	
	24	----	D	D	D	D	D	D	D	D	D	9D.

Test organism: *H. influenzae* type b, No. 641.

0, ±, +, ++, +++=None, very few, few, moderate number, and many colonies which grew from 1 mm. loopful of blood from tail.

Streptomycin 50-percent end point=253 units.

experimentally infected mice. Only one dose of streptomycin was administered followed in 30 minutes by inoculation with the infective dose. Blood cultures were taken at the time indicated by inoculating one loopful of blood from the tail on agar plates. Doses of streptomycin sufficient to produce high blood levels are quite effective in tending to cause rapid disappearance of organisms in the blood stream. Smaller doses of streptomycin insufficient to prevent death of the animal increased the time required for appearance of large numbers

of organisms in the blood of many of the mice. This was also evident in other experiments by the longer time of survival of animals receiving treatment as compared to the controls.

Results of treatment of mice with a combination of antiserum and streptomycin.—In table 5 the effect of combining streptomycin and

TABLE 5.—*Results of treatment of mice with a combination of antiserum and streptomycin*

Therapeutic agent		Results	Survival (percent)
Streptomycin 25 units 3×.	Antiserum 0.5 ml. of 1:1600	11D; 9S	45
Streptomycin 50 units 3×.	Antiserum 0.5 ml. of 1:1600	3D; 17S	85
Streptomycin 25 units 3×.	Antiserum 0.5 ml. of 1:800	2D; 18S	90
Streptomycin 50 units 3×.	Antiserum 0.5 ml. of 1:800	1D; 18S	95
Antiserum:			
0.5 ml. of 1:1600		9D; 1S	10
1:800		8D; 2S	20
1:400		1D; 9S	90
1:200		1D; 9S	90
Streptomycin:			
25 units 3×		10D	0
50 units 3×		5D; 5S	50
100 units 3×		2D; 8S	80

Test organism: *H. influenzae* type b, No. 641.
Antiserum 50-percent end point = 0.5 ml. of 1:591 dilution.
Streptomycin 50-percent end point = 171 units.

specific antiserum is shown. The protective activity of serum alone was shown to be slight when 0.5 ml. of 1:1,600 dilution was used inasmuch as only 10 percent of the mice survived. The effect of a total dosage of 75 units of streptomycin divided into three doses at four hourly intervals was not sufficient to prevent 100 percent mortality. However, when these two doses were combined, 45 percent of the mice survived. When antiserum diluted 1:800 was employed (which alone protected 20 percent of the mice) in combination with a total dosage of 75 units of streptomycin, 90 percent survival was obtained. Although there is a marked increase in protection obtained by combining these two therapeutic agents it is difficult to determine whether the effect is more than purely additive.

Results of treatment of mice with a combination of sulfadiazine and streptomycin.—Combined therapy of experimental infections with streptomycin and sulfadiazine is demonstrated in table 6. Whereas 0.1 mg. of sulfadiazine protected 30 percent of the mice and a total of 75 units of streptomycin resulted in no protection, the combination of the two therapeutic agents in the same amounts produced 100 percent protection. In the protocol presented, culture 576 was employed. This culture was the most sensitive to sulfonamides of 6 cultures studied previously by Pittman (*6*). She noted a difference of 6 times in sensitivity. In the present study we have observed a culture (641) which is more than 25 times as resistant to sulfadiazine

TABLE 6.—*Results of treatment of mice with a combination of sulfadiazine and streptomycin*

Therapeutic agent	Dosage				Survival
Sulfadiazine Streptomycin	0.05 mg 50 units 3×	0.1 mg 25 units 3×	0.1 mg 50 units 3×	0.2 mg 25 units 3×	100 percent survival with each combination
	8S	10S	10S	9S	
Sulfadiazine	0.05 mg	0.1 mg	0.2 mg	0.4 mg	50-percent end point—0.125 mg.
	8D; 2S	6D; 3S	2D; 8S	1D, 9S	
Streptomycin	25 units 3×	50 units 3×	100 units 3×		50-percent end point—178 units
	10D	6D, 4S	1D; 9S		
Culture control	10D				None

Test organism: *H. influenzae* type b, No. 576.

as culture 576. This was in an experiment similar to the one given in table 6. Following treatment with the largest dose employed, 3.2 mg., only 10 percent of the mice survived, whereas 0.125 mg. afforded protection to 50 percent of the mice against culture 576 (table 6). However, a combination of 0.4 mg. of sulfadiazine and a total dosage of 150 units of streptomycin resulted in 50 percent protection as contrasted to 20 percent survival when the same amount of streptomycin alone was employed.

Results of treatment of mice with a combination of penicillin and streptomycin.—Inasmuch as streptomycin and penicillin X were the most effective of the three antibiotics studied, it was desirable to determine the influence of a combination of the two agents on the experimental infection. The results of an experiment in which culture 576 was used are given in table 7. The culture which was relatively resistant to the antibiotics was equally sensitive per unit to streptomycin and penicillin X *in vivo*. Approximately 200 units of each agent alone protected 50 percent of the mice; similar findings were

TABLE 7.—*Results of treatment of mice with a combination of penicillin X and streptomycin*

Therapeutic agent	Dosage			Survival
Penicillin X and streptomycin.	25 units each 3 ×	50 units each 3 ×.		75 units of each 73.7 percent.
	5D; 14S	1D; 18S		150 units of each 94.7 percent.
Penicillin X.	25 units 3 ×	50 units 3 ×	100 units 3 ×.	50 percent end point—204 units.
	10D	9D; 1S	7S	
Streptomycin	25 units 3 ×	50 units 3 ×	100 units 3 ×	50 percent end point—200 units.
	9D	6D; 1S	9S	
Control culture	10D			None.

Test organism: *H. influenzae* type b, No. 576.

reported in table 3. A combination of 75 units of each agent or a total of 150 units protected 73.7 percent of the mice, while only 11.7 percent of all the mice that received 150 units each of streptomycin and penicillin X alone survived. When the amounts were doubled the survival rates were comparable, 94.7 and 100 percent, respectively.

It is apparent that streptomycin and penicillin X are not antagonistic to each other. In combination the effect is at least additive and there is some suggestion of synergistic action, but the latter point remains to be proved.

DISCUSSION

A study of the *in vitro* sensitivity of a number of *H. influenzae* cultures to penicillin, penicillin X, and streptomycin has shown that in general streptomycin is the most effective and that penicillin X is more effective than the usual commercial penicillin (predominantly G) in inhibiting growth. The same relative effectiveness was observed in experiments with mice. The cultures did not show uniformity in relative sensitivity to the respective agents, neither did they show uniform susceptibility to a single agent, although the range of variation was not remarkably large. In the case of the penicillins, the cultures were in general about twice as sensitive per unit of penicillin X as per unit of penicillin G, although a few cultures were equally sensitive to each and one was more sensitive to G than X. Thus the sensitivity of a given strain must be determined in order to treat more intelligently the infection caused by that organism. This is emphasized by the greater amount of drug necessary to confer protection in mice experimentally infected by a culture relatively resistant to a specific drug *in vitro*.

In view of the greater effectiveness of streptomycin as shown experimentally and the fact that blood levels can be attained with streptomycin which on a unit basis are approximately 10 times greater than with penicillin, it appears that streptomycin should prove to be superior to penicillin in the treatment of *H. influenzae* infections. That streptomycin may be effective clinically has been substantiated by the report of Harrell and Nichols (*13*) which appeared just after the completion of our experimental work. They treated four cases of *H. influenzae* meningitis with "good" results; one patient, however, died 2 months later with a postmeningitis hydrocephalus. Additional forms of therapy were used with two cases.

Although it is indicated that streptomycin may be the best of the antibiotics tested for the treatment of *H. influenzae* infections, it is indicated that penicillin, particularly penicillin X, might also have some clinical efficacy. Relatively high antibiotic blood and spinal fluid levels may be obtained in man by large intramuscular and re-

peated intraspinal injections It must be emphasized that since a high concentration of penicillin is required to inhibit growth of *H. influenzae*, initial treatment by large doses should be used to avoid the possibility of rendering the organism penicillin-resistant under conditions of subcurative levels. The influence of penicillin in interfering with or inhibiting the swelling of the capsule further serves to demonstrate an injurious action on the organism by penicillin. This action may explain the failures to obtain a direct typing of the bacteria in spinal fluids from patients who have been treated with penicillin Several such cultures have been sent to one of the authors (Pittman) and typing by capsular swelling was successful only after repeated subculture.

In the treatment of experimentally infected mice, combinations of streptomycin and antiserum, streptomycin and sulfadiazine, and streptomycin and penicillin X seemed to be more effective than might have been expected from a summation of the activity of the respective agents. The work has not been sufficiently extensive to prove that the action is synergistic nor to conclude which combination is the most effective. We have shown that there is no correlation in sensitivity to the three antibiotic agents and sulfadiazine. Previously it had been shown that there was no correlation in sensitivity to sulfadiazine and antiserum (*6*). The latter combination has been effective in reducing the mortality of *H. influenzae* meningitis in children (*8*), (*9*), and it might be expected in treatment with an antibiotic agent that under certain conditions the most effective therapy would result from simultaneous treatment with antiserum, sulfadiazine, or another antibiotic agent.

SUMMARY

1. *In vitro* tests of 38 cultures of *H. influenzae* and 2 cultures of *H. parainfluenzae* showed their sensitivity to penicillin to vary from 0.18 to 1.5 units per milliliter, to penicillin X from 0.05 to 0.75 units per milliliter, and to streptomycin from 1.25 to 10.0 micrograms per milliliter.
2. Using a three-dose technique, streptomycin was found to be the most effective single agent in protecting mice against *H. influenzae* infections; penicillin X was the next most effective single agent.
3. Bacterial strains of the same virulence but of different *in vitro* sensitivity to the antibiotic agents tested produced infections in mice which required varying amounts of therapeutic agents for protection depending upon the *in vitro* sensitivity of the particular strain used.
4. The results of combined treatment with streptomycin and specific antiserum and with streptomycin and sulfadiazine showed a very marked complementary effect. Similar results were obtained by combining streptomycin and penicillin X.

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A METHOD FOR THE PREPARATION OF TSUTSUGAMUSHI (SCRUB TYPHUS) ANTIGEN FROM INFECTED YOLK SACS [1]

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Rickettsia orientalis,[4] the causative agent of tsutsugamushi, grows well in the yolk sacs of embryonated hen's eggs. Suspensions of infected yolk sacs in sterile skimmed milk have been found, at times, lethal for white mice when 0.5 cc. is given intraperitoneally in dilutions of 10^{-8} and 10^{-9}. Smears of infected yolk sacs have repeatedly shown large numbers of rickettsiae, yet great difficulty has been experienced in preparing satisfactory antigens from this material. When yolk sacs have been ground, a stable emulsion has formed that

[1] From the Division of Infectious Diseases, National Institute of Health. This paper was approved for publication February 7, 1945, and scheduled for publication in PUBLIC HEALTH REPORTS in the issue of March 2, 1945. Because of the subject matter the paper was withheld from publication at that time.

[2] Member of the United States of America Typhus Commission.

[3] Assigned to the United States of America Typhus Commission.

[4] Strains of *R. orientalis* for this and other studies of tsutsugamushi have been obtained through the courtesy of the United States of America Typhus Commission.

could be deemulsified with difficulty. Alternate slow freezing and thawing has sometimes broken the emulsion with the formation of a cream layer at the top of an aqueous layer. At times, insoluble tissue has separated, either falling to the bottom or rising to the cream. This deemulsification has not occurred with any great degree of regularity.

Diethyl ether has been tried in a manner similar to its use in the preparation of epidemic typhus vaccine. Here, however, the antigen has usually been found in the emulsion interface that separates the aqueous phase from the excess ether. Some modifications of this technique have been tried, such as coupling the method with freezing and thawing, but antigens satisfactory either in potency or appearance did not result. Other fat solvents such as carbon tetrachloride-chloroform, toluene, xylene, and petroleum ether have been substituted for ether in this method with no success in breaking the emulsion.

Centrifugation of the emulsions has resulted in a splitting of the antigen into the sediments and supernatants even when slow speeds were used. On the other hand 1 hour at 4,000 r. p. m. in the angle centrifuge did not result in sedimentation of all the antigen. However, a method has been developed which produces an antigen specific in the complement-fixation test and very clear in appearance.

METHODS [5]

Infected yolk sacs which had been stored at approximately —40° C. were thawed, weighed, and pooled. They were placed in a wide-mouthed bottle together with about 10 volumes of cold diethyl ether (U. S. P.). The mixture was shaken for 2 hours in the cold room (4° C.) in a mechanical shaking machine. (Glass beads may be used to facilitate the disruption of the membranes and thereby aid in the lipoidal extraction.) The ether turned a deep orange color; the membranes partially disintegrated and became a brownish red amorphous mass.

The mixture was removed from the shaker and allowed to stand in the cold for a few moments until the tissue had completely settled to the bottom of the bottle. The colored ether was removed by decantation and the ether in solution was reduced by a partial vacuum from a water pump. The amorphous mass was then suspended in 2 or 3 volumes of saline containing 0.1 percent formalin and thoroughly ground in a Waring blender. Additional formol-saline was added so that the final fluid volume was approximately 10 times the original weight of the infected yolk sacs. The resulting suspension bore but little resemblance to an ordinary crude 10-percent emulsion of yolk sac. Since the yolk sacs were defatted before blenderizing, the result was a suspension rather than an emulsion.

[5] Since this manuscript was submitted for publication several modifications in this technique have been made by the authors and are to appear in a later publication.

Further purification and concentration at this stage can be accomplished by a variety of procedures. Centrifugation at speeds up to 4,000 r.p.m. for 10 or 15 minutes throws down a considerable quantity of sediment which when resuspended to volume in saline is inactive by complement fixation and for this reason probably can be discarded. The supernatant is active and therefore may be fractionated further. Occasionally there may be some fat and bits of tissue in the supernatant that can be removed by filtering through a layer of cotton.

Ammonium sulfate, $(NH_4)_2SO_4$, may be used to precipitate and concentrate the antigen. With some modifications, the method described by Stanley (*1*) for the isolation and purification of tobacco mosaic virus has been found useful. The centrifuged supernatant that has passed through cotton is further clarified by filtration through "Hyflo Supercel."[6] The antigen in the filtrate is insoluble in 40-percent ammonium sulfate but soluble in saline, distilled water, or 20-percent ammonium sulfate. These differences in solubility allow for fractionation and concentration. The clarified filtrate is brought to a 20-percent concentration by adding, with constant agitation, the proper amount of ammonium sulfate (A. C. S. specification). A turbidity develops after the filtrate stands a few minutes. This is removed by filtering through another layer of Supercel. Sufficient ammonium sulfate is added to the filtrate to bring the total concentration of the salt to 40 percent. A heavy precipitate forms if the mixture is allowed to stand for a few moments. This precipitate, containing the antigen, is collected upon Supercel. The filtrate has, after dialysis, been found to be inactive by complement fixation and is therefore discarded. The filter paper and Supercel are placed in saline or distilled water and shaken vigorously for a few moments to elute the antigen and aid in its solution. The quantity of saline or water used for elution will determine the amount of concentration of the antigen. We have been concentrating 10 times (10 $\times$) by this method. The Supercel is removed by a final filtration with the antigen remaining this time in the filtrate. The antigen may contain an undesirable concentration of ammonium sulfate which can be reduced by dialysis in a cellophane tube against running water.

An alternate method using cold ethanol in varying concentrations in the cold also can be used. The main portion of the antigen is soluble in 8-percent ethanol but insoluble in 25-percent. The relatively inactive precipitate which forms in 8-percent ethanol can be separated by centrifugation at 0° to 4° C. The supernatant, containing the antigen, can then be brought to a 25-percent concentration by adding cold ethanol.

[6] A filter aid produced by the Johns Manville Co.

A heavy precipitate forms which can be separated by centrifugation in the cold. The precipitate can then be brought to the desired volume in saline. Traces of ethanol remaining may be removed by dialysis.

DISCUSSION

The defatting of whole yolk sacs by ether in the cold allows the preparation of a crude tissue suspension that is susceptible to further purification and concentration. It appears that this procedure had best be done with temperature control. Extractions made at room temperature have indicated a loss of antigen. When extracting, the amount of ether is also a factor, as with 5 volumes the fat is not entirely removed, since the resulting suspension is more turbid than when 10 volumes have been used. There seems to be no advantage in using larger volumes. When several changes of ether were used there was a considerable loss in antigen, perhaps as much as 50 percent (as estimated by complement fixation). Fulton and Begg (*2*) have indicated some slight denaturation of epidemic typhus antigen when ether was used in processing the yolk-sac emulsions. Such change, however, does not seem to interfere with the immunogenic properties of epidemic typhus vaccine.

There is some loss of antigen, probably by adsorption, in passing through Supercel. Stanley's studies (*1*) of tobacco mosaic virus indicated that some virus could always be demonstrated on the celite filter. His final highly purified product contained, however, approximately 80 percent of the original infectious material. In our studies, by dissolving the precipitate that occurs in 40-percent ammonium sulfate in less than the original volume of saline, not only the loss can be compensated for but actual concentration can be accomplished.

The ethanol or the ammonium sulfate may further denature the antigen; both final products are, however, active when tested by complement fixation. In limited studies it seems that there is more loss with the ethanol technique than with ammonium sulfate. The potency by complement fixation does not seem to depend upon the presence of rickettsiae stainable with methylene blue. The immunizing properties of the various preparations of antigens are under investigation at the present time.

REFERENCES

(*1*) Stanley, W. N.: Isolation and properties of virus proteins. Ergebnisse der Physiologie, 29: 294 (1937).
(*2*) Fulton, Forrest, and Begg, A. M.: The antigenic structure of typhus rickettsiae. Unpublished manuscript dated April 12, 1944.

A CHARTER FOR SCHOOL HEALTH

A Review

The 1945 revision of "Suggested School Health Policies," [1] carries the significant subtitle "A Charter for School Health." The report is offered as "a clear, comprehensive, printed statement of the consensus of well-informed professional opinion concerning many specific policies which directly or indirectly affect the health of children and adults." The report is not a blueprint of a school health program that can be applied uniformly and inflexibly to every community, but it is a guide which all concerned with school health programs in any capacity can consider and adapt to their local conditions.

Schools have definite responsibilities for protecting the health of pupils and have tremendous opportunities to improve the health of pupils and communities. The title "Suggested School Health Policies" indicates that these responsibilities may be met and these opportunities utilized by action based on the following recommendations.

Schools can:

Organize a school health council;

Make provision for healthier school living by raising their standards of inspection for safety and sanitation, by employing more understanding and emotionally stable teachers, by paying more attention to the health of school personnel, and even by serving better food;

Improve the quality of health and safety instruction by according more time, securing better-qualified teachers, granting more scholastic credit and providing more adequate teaching materials;

Clarify and sharpen their programs for the prevention and control of communicable diseases and avoidable accidents:

Institute wider programs of health counseling, including keener teacher observation, more frequent screening tests, and more useful medical and psychological examinations;

Enforce more intelligent precautions in physical education and athletic programs;

Identify sooner and provide more sensibly for handicapped children;

Provide in-service education to help teachers to understand the health problems of children;

Participate in programs of parent and community health education; and

Seek qualified medical advisers, nurses, health educators, and other necessary specialized health personnel.

School health programs are recognized as cooperative activities in which many individuals take part, including teachers, school administrators, physicians, nurses, psychologists, and dentists. The protection and improvement of the health of children requires coordinated efforts by parents, pupils, the schools, the health department, pro-

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[1] Report prepared by the National Committee on School Health Policies of the National Conference for Cooperation in Health Education.

fessional health groups and others. "Cooperation is the keynote essential to the coordination of the efforts of all concerned with child health. Only in this way can schools and communities develop balanced programs of health education and health care. Only thus can a school avoid false emphasis on one phase of its health program with corresponding neglect of other equally vital areas. School health policies must be formulated to achieve the maximum cooperation and coordination both within each school and each school system and between each school and the community."

The report recommends that school health programs include health counseling. This is described as "the planned, cooperative effort on the part of teachers, nurses, physicians, psychologists, dentists and others to discover the health needs and health problems of students and to help them and their families find ways of meeting the needs and solving the problems. Determining health needs and problems involves the use of teacher observations, screening tests, reports from pupils and parents, psychological examinations and medical examinations. Each of these methods is used effectively in a well-planned program. The value of health counseling depends in part on the complete utilization of all community resources for protecting and improving health and, if necessary, augmenting these resources."

In order that health counseling shall actually improve the health of pupils it is essential that resources for medical and dental treatment be adequate. "A school may properly insist that all community resources be made available to meet the health needs of the students in the school. Such resources would naturally include appropriate opportunities for specialized medical consultation of a diagnostic nature. When resources outside the school or school system are utilized (whether private physicians, public clinics or voluntary agencies), efficient liaison arrangements must be made by the school. In particular, full provision should be made for two-way exchange of pertinent information between the school and the cooperating community agencies."

Suggested School Health Policies,[2] a 46-page pamphlet, includes recommendations relating to all aspects of school health programs. Specific sections are devoted to each of the following topics: (1) Provisions for healthful school living, (2) health and safety instruction, (3) services for health protection and improvement, (4) health aspects of physical education, (5) education and care of the handicapped, and (6) qualifications of school health personnel.

The National Committee on School Health Policies included representation from different national professional groups. The

[2] Single free copies may be secured from the American Medical Association, 535 N. Dearborn St., Chicago 10, Ill. Sale copies may be obtained from the Health Education Council, 10 Downing St., New York 14, N. Y.

names of members, together with the name of the organizations which nominated them for membership, are as follows:

W. E. Ayling, M. D., American School Health Association.
W. W. Bauer, M. D., American Medical Association.
Edward S. Evenden, Ph. D., American Association of Teachers Colleges.
Raymond A. Green, M. A., Secondary School Principals Association.
W. H. Lemmel, Ed. D., American Association of School Administrators.
S. S. Lifson, M. A., U. S. Public Health Service.
Ben Miller, Ph. D., American Association for Health, Physical Education and Recreation.
Harold H. Mitchell, M. D., American Academy of Pediatrics.
Dorothy Nyswander, Ph. D., American Public Health Association.
Thurman B. Rice, M. D., Joint Committee on Health Problems in Education of the National Education Association and American Medical Association.
Justus J. Schifferes, (Secretary).
Maycie Southall, Ph. D., Educational Policies Commission.
Frank Stafford, M. A., U. S. Office of Education.
George M. Wheatley, M. D., U. S. Children's Bureau.
Alberta B. Wilson, R. N., National Organization for Public Health Nursing.
Charles C. Wilson, M. D. (Chairman).
J. M. Wisan, D. D. S., American Dental Association.

Every community can advantageously evaluate its present school health program and plan ways for improving it. An important step is the development of specific policies. This needs to be followed by action, by translating the policies into procedures. As this is done the health of our Nation will be improved.

OUTBREAK OF Q FEVER IN THE UNITED STATES[1]

By J. V. Irons, *Acting Director of Laboratories, Texas State Department of Health;* N. H. Topping, *Senior Surgeon, United States Public Health Service;* C. C. Shepard, *Passed Assistant Surgeon, United States Public Health Service;* and H. R. Cox, *Director of Virus Research, Lederle Laboratories, Inc.*

During the second and third weeks of March 1946 an explosive outbreak of an acute febrile illness which has been identified as Q fever occurred at Amarillo, Tex. More than 40 cases, mostly in men, have been found. The illnesses varied from mild influenza-like attacks to severe pneumonitis or atypical pneumonia. It appears that inapparent infections also occurred. There were two deaths. Cases occurred among employees of a stockyards and meat-packing company, and in railroad workers and others working around the stockyards. In the stockyards, cattle, sheep, and hogs are unloaded and loaded, fed and watered, and bought and sold. Animals are transported in and out both by train and truck. Some of the animals are slaughtered and processed at the nearby packing plant. Although

[1] From the Division of Infectious Diseases, National Institute of Health.

the packing plant handles both hogs and cattle, preliminary investigations suggested that cattle were probably involved in the human infections.

Recognition of the outbreak as Q fever has been so far based upon both the clinical and serological findings. Early acute phase serums from the cases were negative in complement-fixation tests, while convalescent serums or serums from recovered cases had high complement-fixation titers with several Q fever antigen preparations. Agglutination tests with Q fever rickettsial suspensions gave positive results in agreement with complement-fixation findings. All tests performed for other acute febrile conditions gave negative results.

Recovery of *Rickettsia burneti* is being attempted from specimens obtained during acute illness and stored in the frozen state. Further details concerning the outbreak and results of laboratory studies in progress will be published at a later date.

NOTICE TO AIR TRAVELERS REGARDING YELLOW FEVER IMMUNIZATION

The International Sanitary Convention for Aerial Navigation of 1933 as amended by the Convention of 1944 provided for isolation of persons who do not hold a valid anti-yellow fever inoculation certificate and who are traveling by air from an endemic yellow fever area to one in which the disease does not exist, but in which conditions may permit of its development. Such persons may be isolated in screened quarters until such a certificate becomes valid or until 6 days shall have elapsed, whichever is the lesser period. The Convention also provided that, in exceptional cases, the countries signatory to the Convention may issue "Certificates of Urgency" to persons not immunized against yellow fever "whose unobstructed passage is absolutely and immediately essential on grounds of high policy, certifying that a passage without hindrance to the bearer of the certificate is urgently necessary."

Official information has been received that the Government of the Union of South Africa and the Government of Southern Rhodesia no longer accept these certificates of urgency issued to persons traveling through endemic yellow fever areas to the respective countries, nor issue such certificates to persons leaving these countries.

In consequence, persons who have not been inoculated against yellow fever will no longer be able, by means of a certificate of urgency, to avoid quarantine delays on arriving in Southern Rhodesia or the Union of South Africa from those parts of Africa in which yellow fever is endemic. Such travelers may be held in quarantine if they have not strictly complied with the yellow fever immunization requirements.

DEATHS DURING WEEK ENDED MAY 4, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 4, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,974	8,920
Average for 3 prior years	9,123	
Total deaths, first 18 weeks of year	178,222	171,652
Deaths under 1 year of age	648	508
Average for 3 prior years	619	
Deaths under 1 year of age, first 18 weeks of year	10,989	11,359
Data from industrial insurance companies:		
Policies in force	67,173,242	67,274,267
Number of death claims	12,517	15,085
Death claims per 1,000 policies in force, annual rate	9.7	11.7
Death claims per 1,000 policies, first 18 weeks of year, annual rate	10.9	11.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 11, 1946

Summary

Of the total of 4 cases of smallpox, 2 occurred in Texas and 1 each in Ohio and Colorado. The total for the year to date is 193, as compared with 198 for the corresponding period last year and 419 for the 5-year median (see p. 794).

Increased incidence of measles was reported during the week in only 2 of the 9 geographic divisions—the South Atlantic, where moderate increases occurred in 5 States, and in the Mountain area. In the latter, 1,684 cases were reported in Colorado, as compared with 446 last week. The total for the week is 35,208 (more than for a corresponding week since 1941), as compared with 39,902 last week and a 5-year (1941–45) median of 25,813. The cumulative figure is 454,338, as compared with 480,684 for the same period in 1944 and a 5-year median of 368,642.

Of the current total of 245 cases of diphtheria, the same number as reported last week, Texas reported 25, New York and Colorado 18 each, Ohio 17, California 16, and Pennsylvania 13. The total for the year to date is 6,670, as compared with a 5-year median of 5,253. Both the current and cumulative totals are more than reported for the respective corresponding periods of any year since 1939.

Of the total of 56 cases of poliomyelitis (as compared with 23 last week, 47 for the next earlier week, and a 5-year median of 28), Florida reported 17, and Texas 16. The total for the country as a whole since March 16, the week of lowest incidence (except last week) for both this year and last, is 263, as compared with 251 for the corresponding period last year.

Of 115 cases of meningococcus meningitis reported for the week (as compared with 95 last week and a 5-year median of 178), New York reported 13, Pennsylvania 12, and Virginia and California 9 each. The cumulative total is 3,286, as compared with an average of 7,845 for the corresponding periods of the past 3 years, and a 5-year median for the period of 4,345.

Deaths recorded for the week in 93 large cities of the United States aggregated 9,144, as compared with 8,974 last week, 9,147 and 9,098, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,229. The cumulative figure is 187,366, as compared with 180,799 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended May 11, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945	
NEW ENGLAND												
Maine	4	0	0	1			143	3	51	1	0	1
New Hampshire	0	0	0				42	2	38	0	0	1
Vermont	1	0	1	2			39	13	66	0	0	0
Massachusetts	8	4	4				2,683	216	971	1	2	6
Rhode Island	1	0	0		21	1	35	6	52	1	1	1
Connecticut	2	0	0	1		1	411	77	422	2	3	3
MIDDLE ATLANTIC												
New York	18	12	15	[1] 5	(1)	[1] 5	4,265	89	1,555	13	24	21
New Jersey	11	2	3	4	2	5	4,170	54	1,192	5	6	6
Pennsylvania	13	6	10	1	1	1	3,414	417	1,329	12	12	12
EAST NORTH CENTRAL												
Ohio	17	2	6	3	1	8	999	52	497	5	12	12
Indiana	6	7	7	1	8	1	493	33	219	3	4	4
Illinois	8	4	14	9	11	11	792	237	695	7	14	14
Michigan [2]	5	3	3			2	1,027	215	902	5	1	2
Wisconsin	0	1	1	14	22	28	2,968	63	1,800	3	1	1
WEST NORTH CENTRAL												
Minnesota	7	3	3				43	9	379	1	2	2
Iowa	2	2	2			1	156	70	223	3	1	1
Missouri	1	10	4	1		2	126	8	251	3	7	7
North Dakota	2	0	1	2	2	2	16	4	21	0	3	1
South Dakota	5	1	1				39	6	19	0	0	0
Nebraska	0	2	1		4	4	344	32	80	0	1	0
Kansas	6	4	4			1	320	47	542	0	1	1
SOUTH ATLANTIC												
Delaware	0	0	0				22	3	13	0	0	0
Maryland [2]	8	9	3	4	2	5	682	22	356	3	1	5
District of Columbia	2	1	0	1	1	1	338	4	123	5	1	2
Virginia	8	3	3	102	77	114	763	27	326	9	5	5
West Virginia	1	2	2		35	10	302	8	159	1	1	1
North Carolina	8	1	6			4	537	45	706	0	2	2
South Carolina	4	6	4	205	163	163	439	18	127	0	1	1
Georgia	1	3	3	2	8	35	141	21	175	0	1	1
Florida	3	1	3			11	201		219	1	7	2
EAST SOUTH CENTRAL												
Kentucky	11	1	3			1	157	30	113	4	3	3
Tennessee	0	1	2	12	26	29	270	63	154	2	9	9
Alabama	2	8	4	11	20	29	228	13	205	1	5	5
Mississippi [2]	7	0	8							3	3	3
WEST SOUTH CENTRAL												
Arkansas	3	1	2	29	23	21	123	34	161	1	2	2
Louisiana	0	5	4	7	5	2	190	26	43	0	2	2
Oklahoma	3	4	4	8	117	44	254	40	153	0	1	1
Texas	25	32	23	185	518	472	1,694	411	991	6	10	10
MOUNTAIN												
Montana	0	2	2	5	11	4	85	19	118	0	0	0
Idaho	1		0	3			141	49	49	1	0	0
Wyoming	0		0			1	38	7	93	0	1	0
Colorado	18	8	7	10	11	23	1,684	30	260	0	1	2
New Mexico	*0	2	0		1	1	67	6	27	0	0	0
Arizona	2	3	2	14	34	34	150	9	78	0	0	0
Utah [2]	0	0	0		15	6	343	283	252	0	1	1
Nevada	0	0	0		36				4	0	0	0
PACIFIC												
Washington	4	5	1		1		527	178	236	2	5	4
Oregon	1	4	0	4	4	8	330	95	185	2	2	0
California	16	20	8	10	12	29	2,968	1,510	1.510	9	19	17
Total	245	197	187	856	1,221	1,150	35,208	4,634	25,813	115	178	178
19 weeks	6,670	5,336	5,253	183,596	60,323	73,372	454,338	59,109	368,642	3,286	4,345	4,345

[1] New York City only.
[2] Period ended earlier than Saturday.

*Correction: New Mexico, week ended Apr. 27, diphtheria 3 cases (instead of 0).

Telegraphic morbidity reports from State health officers for the week ended May 11, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945		May 11, 1946	May 12, 1945	
NEW ENGLAND												
Maine	0	1	0	14	65	12	0	0	0	1	0	0
New Hampshire	0	0	0	4	5	6	0	0	0	0	0	0
Vermont	0	1	0	12	16	9	0	0	0	0	0	0
Massachusetts	0	1	0	187	392	345	0	0	0	0	1	1
Rhode Island	0	0	0	20	17	17	0	0	0	0	0	0
Connecticut	0	0	0	69	63	67	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	4	6	3	594	657	504	0	0	0	0	3	4
New Jersey	0	0	0	179	144	158	0	0	0	0	1	1
Pennsylvania	1	0	0	380	518	406	0	0	0	2	4	4
EAST NORTH CENTRAL												
Ohio	0	2	1	382	312	297	1	1	0	1	7	3
Indiana	0	0	0	56	122	82	0	0	0	2	1	2
Illinois	1	1	0	186	261	261	0	0	0	0	2	2
Michigan [2]	0	0	0	152	258	258	0	0	0	1	2	1
Wisconsin	1	1	1	122	221	221	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	2	0	60	81	49	0	0	0	0	0	0
Iowa	3	0	0	46	39	39	0	0	1	4	0	0
Missouri	1	0	0	33	62	138	0	0	0	4	0	2
North Dakota	1	0	0	5	8	5	0	0	0	0	1	1
South Dakota	0	0	0	11	9	12	0	0	0	0	0	0
Nebraska	0	0	0	12	58	26	0	0	0	0	0	0
Kansas	1	0	0	35	91	63	0	0	0	0	3	2
SOUTH ATLANTIC												
Delaware	0	0	0	4	8	8	0	0	0	0	0	0
Maryland [2]	0	0	0	200	180	154	0	0	0	0	0	0
District of Columbia	0	0	0	14	35	18	0	0	0	1	1	0
Virginia	0	1	0	72	66	41	0	0	0	0	3	2
West Virginia	0	0	0	35	43	34	0	0	1	2	0	1
North Carolina	0	0	0	27	53	16	0	0	0	0	2	1
South Carolina	1	7	1	5	6	5	0	1	0	2	2	2
Georgia	0	0	0	2	20	19	0	0	0	6	3	4
Florida	17	1	2	3	8	4	0	0	0	3	0	1
EAST SOUTH CENTRAL												
Kentucky	1	0	1	14	48	48	0	0	0	0	3	3
Tennessee	0	2	0	12	44	44	0	1	0	2	2	3
Alabama	2	0	0	19	21	8	0	0	0	3	1	1
Mississippi [2]	0	2	2	5	13	5	0	0	0	1	0	3
WEST SOUTH CENTRAL												
Arkansas	1	0	0	10	10	7	0	0	0	2	2	2
Louisiana	1	0	0	7	9	3	0	0	0	2	4	5
Oklahoma	0	0	0	10	26	16	0	0	0	0	1	1
Texas	16	3	2	47	81	58	2	4	1	11	11	7
MOUNTAIN												
Montana	0	0	0	4	20	18	0	0	0	0	1	0
Idaho	0	0	0	9	10	10	0	0	0	0	0	1
Wyoming	0	0	0	8	8	16	0	0	0	1	0	0
Colorado	2	1	0	55	56	56	1	1	0	2	0	1
New Mexico	0	0	0	4	21	10	0	0	0	3	1	0
Arizona	0	0	0	10	21	9	0	0	0	0	0	0
Utah [2]	0	0	0	21	16	20	0	0	0	0	1	0
Nevada	0	0	0	0	0	2	0	0	0	0	0	0
PACIFIC												
Washington	0	0	0	18	68	31	0	0	0	0	1	1
Oregon	0	0	0	42	36	13	0	1	0	1	0	0
California	2	0	3	142	334	166	0	0	0	2	1	4
Total	56	32	28	3,358	4,660	3,963	4	9	24	59	65	86
18 weeks	729	648	436	66,503	103,420	75,724	193	198	419	956	1,114	1,376

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Ohio 1; South Carolina 1; Georgia 6; Florida 2; Tennessee 1; Texas 2; Colorado 1; California 1.

Telegraphic morbidity reports from State health officers for the week ended May 11, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— May 11, 1946	Whooping cough: Week ended— May 12, 1945	Whooping cough: Median 1941–45	Week ended May 11, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	6	40	30								
New Hampshire		2	2								
Vermont	7	11	11								2
Massachusetts	137	158	158								1
Rhode Island	17	16	16				1				
Connecticut	40	53	51								
MIDDLE ATLANTIC											
New York	161	166	200	4	6						7
New Jersey	181	111	111				1				2
Pennsylvania	116	209	219								2
EAST NORTH CENTRAL											
Ohio	73	143	143								
Indiana	2	8	36		1						
Illinois	83	43	99		1						8
Michigan [2]	124	61	187		2						4
Wisconsin	84	41	134								6
WEST NORTH CENTRAL											
Minnesota	10	13	48	2							2
Iowa	33	3	18								2
Missouri	8	14	19			1					
North Dakota		1	7								
South Dakota		2	5								3
Nebraska		8	7				(*)				
Kansas	39	20	42								14
SOUTH ATLANTIC											
Delaware	5	1	1								
Maryland [2]	19	79	79			1		2			2
District of Columbia	8	7	19								
Virginia	110	58	65			35		3			1
West Virginia	51	5	16								
North Carolina	65	134	134					1			
South Carolina	44	57	62	4	26					1	
Georgia	12	17	28	1	1			1	2	6	2
Florida	15	7	12							3	
EAST SOUTH CENTRAL											
Kentucky	9	63	63		1						
Tennessee	8	29	41			2			1		
Alabama	23	21	51						1	11	2
Mississippi [2]									2	1	1
WEST SOUTH CENTRAL											
Arkansas	11	9	9	2							1
Louisiana	·25	4	4	1					2		2
Oklahoma	7	29	29					3			
Texas	160	276	276	17	347	30				8	14
MOUNTAIN											
Montana	1	3	14								
Idaho	15	6	7					2			2
Wyoming	4		5						1		1
Colorado	56	37	37	1			1		0		
New Mexico	16	4	14								
Arizona	32	28	28			52					1
Utah [2]	19	44	43					1	1		1
Nevada		2	3								
PACIFIC											
Washington	28	26	35								1
Oregon	17	20	21								
California	84	471	431	3	1					(4)	6
Total	1,965	2,576	3,658	35	386	121	3	13	10	30	90
Same week, 1945	2,576			33	374	106	9	10	8	58	104
Average, 1943–45	2,800			26	369	74	7	[5] 16	17	[5] 50	
19 weeks: 1946	35,000			704	5,647	1,989	*156	42	339	857	1,553
1945	47,302			563	8,122	2,191	129	32	302	932	1,642
Average, 1943–45	52,767		[5] 73,019	536	5,436	1,456	183	[5] 54	272	[5] 792	

[2] Period ended earlier than Saturday.
[4] One case of louse-borne typhus fever reported in the U. S. Naval Hospital, San Diego, Calif., May 10, with onset on board ship Apr. 5, one day after leaving Yokosuka, Japan. Patient recovered.
[5] 5-year median, 1941–45.

Anthrax: Massachusetts, 1 case *Leprosy:* Florida, 1 case.
*Correction: Nebraska, week ended Apr. 27, encephalitis 2 cases (instead of 12).

WEEKLY REPORTS FROM CITIES

City reports for week ended May 4, 1946

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	0	0	2	0	0	8
New Hampshire:												
Concord	0	0	------	0	2	0	0	0	0	0	0	------
Vermont:												
Barre	1	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	1	0	------	0	464	1	11	0	40	0	1	8
Fall River	0	0	------	0	204	0	0	0	5	0	0	1
Springfield	0	0	------	0	78	0	0	0	8	0	0	1
Worcester	0	0	------	0	324	0	7	0	4	0	0	32
Rhode Island:												
Providence	0	0	------	0	23	0	0	0	5	0	1	13
Connecticut:												
Bridgeport	0	0	------	0	2	1	0	0	1	0	0	------
Hartford	0	0	------	0	4	1	2	0	2	0	0	2
New Haven	0	0	------	0	------	0	1	0	2	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	3	0	------	0	126	2	4	0	10	0	0	10
New York	10	2	7	0	1,481	3	72	1	287	0	0	31
Rochester	0	0	------	0	253	0	2	0	15	0	0	------
Syracuse	0	0	------	0	32	1	3	0	11	0	0	1
New Jersey:												
Camden	2	0	1	1	39	0	1	0	1	0	0	5
Newark	0	0	2	0	633	0	5	0	20	0	0	24
Trenton	0	0	------	0	59	0	2	0	5	0	0	2
Pennsylvania:												
Philadelphia	2	0	1	1	591	3	10	0	70	0	1	15
Pittsburgh	2	0	1	1	14	1	10	0	25	0	2	6
Reading	0	0	------	0	37	0	0	0	7	0	0	3
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	3	0	------	0	58	1	8	0	9	0	0	3
Cleveland	0	0	2	0	141	1	7	0	54	0	0	23
Columbus	3	0	------	0	5	1	1	0	8	0	0	------
Indiana:												
Fort Wayne	0	0	------	0	2	0	1	0	3	0	0	------
Indianapolis	0	0	------	0	210	0	1	0	12	0	0	15
South Bend	0	0	------	0	6	0	0	0	5	0	0	------
Terre Haute	0	0	------	0	6	0	0	0	0	0	0	1
Illinois:												
Chicago	0	0	1	0	348	3	34	0	0	0	0	41
Springfield	0	0	------	0	5	0	3	0	3	0	0	------
Michigan:												
Detroit	0	0	------	1	325	3	15	0	52	0	2	49
Flint	1	0	------	0	4	0	3	0	5	0	0	1
Grand Rapids	0	0	------	0	206	0	1	0	10	0	0	2
Wisconsin:												
Kenosha	0	0	------	0	76	0	0	0	1	0	0	------
Milwaukee	0	0	------	0	1,982	0	7	0	24	0	0	30
Racine	0	0	------	0	60	0	0	0	8	0	0	------
Superior	0	0	------	0	1	0	0	0	0	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	4	0	0	0	0	0	0	5
Minneapolis	3	0	------	0	21	0	1	0	14	0	0	------
St. Paul	3	0	------	0	13	3	3	0	9	0	0	1
Missouri:												
Kansas City	0	0	------	1	7	0	7	1	2	0	0	------
St. Joseph	0	0	------	0	------	0	0	0	1	0	0	------
St. Louis	2	0	1	0	127	3	4	1	9	0	0	4

City reports for week ended May 4, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza: Cases	Influenza: Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	0	------	0	41	0	3	0	3	0	0	1
Kansas:												
Topeka	0	0	------	0	4	0	0	0	16	0	0	10
Wichita	0	0	1	1	133	0	3	0	5	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	37	0	2	0	1	0	0	------
Maryland:												
Baltimore	7	0	1	1	469	0	6	0	30	0	1	15
Cumberland	0	0	------	0	1	0	0	1	3	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	0	384	0	4	0	13	0	0	12
Virginia:												
Lynchburg	0	0	------	0	41	0	0	0	0	0	0	------
Richmond	0	0	22	2	48	1	0	1	10	0	0	8
Roanoke	0	0	------	0	6	0	0	0	1	0	0	------
West Virginia:												
Charleston	0	0	------	0	3	0	0	0	2	0	0	------
Wheeling	2	0	------	0	------	0	2	0	0	0	0	20
North Carolina:												
Raleigh	0	0	------	0	22	0	1	0	0	0	0	------
Wilmington	0	0	------	0	17	0	1	0	0	0	0	------
Winston-Salem	0	0	------	0	32	0	0	0	2	0	0	3
South Carolina:												
Charleston	0	0	------	0	3	0	1	0	1	0	1	------
Georgia:												
Atlanta	1	0	1	1	26	0	3	0	1	0	0	1
Brunswick	0	0	------	0	4	0	0	0	0	0	0	3
Savannah	0	0	------	0	2	1	1	0	1	0	0	------
Florida:												
Tampa	1	0	------	0	27	0	1	0	1	0	0	4
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	1	------	0	29	0	6	0	7	0	1	1
Nashville	0	0	------	1	2	0	3	0	3	0	0	4
Alabama:												
Birmingham	0	0	1	0	24	0	1	0	0	0	0	------
Mobile	0	0	------	1	2	0	0	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	4	0	26	0	0	0	0	0	0	------
Louisiana:												
New Orleans	2	0	3	0	35	0	3	1	8	0	0	------
Shreveport	0	0	------	0	------	0	1	0	5	0	0	------
Texas:												
Dallas	1	0	------	0	45	0	3	0	2	0	1	------
Galveston	0	0	------	0	1	0	0	0	0	0	0	------
Houston	2	0	------	0	3	2	5	0	1	0	0	------
San Antonio	1	0	------	0	18	0	2	0	0	0	0	------
MOUNTAIN												
Montana:												
Billings	0	0	------	0	------	0	0	0	0	0	0	------
Great Falls	0	0	------	0	11	0	0	0	0	0	0	------
Helena	0	0	------	0	9	0	0	0	0	0	0	------
Missoula	0	0	------	0	4	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	1	0	0	0	0	------
Colorado:												
Denver	5	0	------	0	706	0	3	4	12	0	0	14
Pueblo	0	0	------	0	42	0	0	0	1	0	0	------
Utah:												
Salt Lake City	0		------	1	115	0	2	0	4	0	0	6

City reports for week ended May 4, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	3	0		1	74	0	3	0	0	2	0	3
Spokane	0	0		0	43	0	0	0	2	0	0	5
Tacoma	0	0		0		0	0	0	0	0	0	
California:												
Los Angeles	2	0	7	0	453	1	3	0	44	0	0	9
Sacramento	0	0		0	260	0	1	0	3	0	0	1
San Francisco	4	0	1	1	209	0	2	0	15	0	1	1
Total	68	3	57	15	11,384	33	293	10	946	2	12	462
Corresponding week, 1945	55		20	8	1,348		300		1,505	0	9	699
Average, 1941-45	59		73	[1] 22	[2] 6,312		[1] 375		1,573	0	14	966

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia 1.
Dysentery, amebic.—Cases: New York 2; Chicago 3; St. Louis 2; Baltimore 1; San Antonio 1; Los Angeles 2.
Dysentery, bacillary.—Cases: Buffalo 1; New York 5; Detroit 2; Memphis 1; San Francisco 1.
Dysentery, unspecified.—Cases: Cincinnati 1; San Antonio 21.
Rocky Mountain spotted fever.—Cases: Atlanta 1.
Tularemia.—Cases: Memphis 1.
Typhus fever, endemic.—Cases: New York 1; Savannah 1; Little Rock 1; New Orleans 3; Shreveport 1; Houston 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 34,366,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	5.2	0.0	0.0	0.0	2,878	7.8	54.9	0.0	180	0.0	5.2	170
Middle Atlantic	8.8	0.9	5.6	1.4	1,511	4.6	50.5	0.5	209	0.0	1.4	46
East North Central	4.3	0.0	1.8	0.6	2,089	5.5	49.3	0.0	118	0.0	1.2	100
West North Central	18.1	0.0	4.0	4.0	704	12.1	42.2	4.0	119	0.0	0.0	44
South Atlantic	18.0	0.0	39.2	6.5	1,834	3.3	36.0	3.3	108	0.0	3.3	108
East South Central	0.0	5.9	5.9	11.8	336	0.0	59.0	0.0	59	0.0	5.9	30
West South Central	17.2	0.0	20.1	0.0	367	5.7	40.2	2.9	46	0.0	2.9	0
Mountain	39.7	0.0	0.0	7.9	7,045	0.0	47.7	31.8	135	0.0	0.0	159
Pacific	14.2	0.0	12.7	3.2	1,643	1.6	14.2	0.0	101	3.2	1.6	30
Total	10.3	0.5	8.7	2.3	1,732	5.0	44.6	1.5	144	0.3	1.8	70

PLAGUE INFECTION IN SANTA BARBARA AND VENTURA COUNTIES, CALIF.

Plague infection was reported under date of May 2 to have been proved, on May 1, in a pool of 128 fleas from 9 ground squirrels, *C. beecheyi*, shot 1 mile south of Buellton, Santa Barbara County, Calif. Under date of May 2 plague infection was reported proved, on April 30, in tissue from 4 rats, *R. alexandrinus*, trapped ½ mile south and 2 miles east of Santa Paula, Ventura County, Calif., and on May 1 in

a pool of 90 fleas from the same rats; also, under date of May 8, proved on May 6, in tissue from 1 ground squirrel, *C. beecheyi*, shot at the same location.

SMALLPOX IN SAN FRANCISCO, CALIF., AND SEATTLE, WASH.

Week ended May 11, 1946

No new case of smallpox was reported in either San Francisco or Seattle during the week, leaving the totals for the States at 13 for California (9 in San Francisco—6 with origin in the city, 3 with origin outside the United States), and 59 cases in Washington State (50 in Seattle and King County). One additional death from smallpox was reported in the Seattle area during the week, bringing the total deaths to date in that area to 17 (15 in Seattle and King County, 2 in Everett).

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (in ectoparasites).—Plague infection was proved positive on April 13, 1946, in a pool of 54 fleas and 15 lice collected from 7 rats and 22 mice trapped on March 28, 1946, in District 14BA, Island of Maui, T. H.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—April 13, 1946.—During the week ended April 13, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		2		132	192	22	26	15	56	445
Diphtheria		3	3	13	9	1				29
Dysentery, bacillary				2						2
Encephalitis, infectious								1		1
German measles				22	31	1		13	12	79
Influenza		521			30	3			38	592
Measles		160	16	662	1,150	21	1	68	14	2,092
Mumps				65	195	75	16	46	67	464
Poliomyelitis								1		1
Scarlet fever	2	4	2	72	94	14	1	8	6	203
Tuberculosis (all forms)		13	2	144	67	23	11	21	27	308
Typhoid and paratyphoid fever				6	3					9
Undulant fever				5	2					7
Venereal diseases:										
Gonorrhea	11	17	13	126	157	48	30	40	97	539
Syphilis	3	17	3	148	114	14	12	7	32	350
Other forms									1	1
Whooping cough		51		100	65	4		10	13	243

CUBA

Habana—Communicable diseases—4 weeks ended April 27, 1946.—During the 4 weeks ended April 27, 1946, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chickenpox	7		Scarlet fever	2	
Diphtheria	16		Tuberculosis	12	2
Malaria	1		Typhoid fever	23	2
Measles	4				

Provinces—Notifiable diseases—4 weeks ended April 20, 1946.—During the 4 weeks ended April 20, 1946, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	4	25	12	9	3	15	68
Chickenpox		10	4		2	6	22
Diphtheria	1	11				1	13
Hookworm disease	1	17					18
Leprosy		4	1	1	1		7
Malaria	8	2		2	4	92	108
Measles		2			4	15	21
Poliomyelitis					1	2	3
Scarlet fever		2					2
Tuberculosis	12	43	25	74	25	34	213
Typhoid fever	21	42	9	32	20	38	162
Whooping cough					2		2

[1] Includes the city of Habana.

NORWAY

Notifiable diseases—December 1945.—During the month of December 1945, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	9	Mumps	99
Diphtheria	553	Pneumonia (all forms)	2,792
Dysentery, unspecified	14	Poliomyelitis	30
Encephalitis, epidemic	3	Rheumatic fever	205
Erysipelas	493	Scabies	6,006
Gastroenteritis	4,139	Scarlet fever	523
Gonorrhea	667	Syphilis	106
Hepatitis, epidemic	847	Tuberculosis (all forms)	356
Impetiga contagiosa	4,177	Typhoid fever	7
Influenza	3,144	Typhus fever	2
Malaria	2	Whooping cough	3,018
Measles	5,595		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–February 1946	March 1946	April 1946—week ended—			
				6	13	20	27
ASIA							
Burma	C	22	90	26			
Rangoon	C	1	1				
Ceylon	C					[1] 3	
China:							
Fukien Province	C		1				
Hupeh Province	C	[2] 52	28		3		
Hunan Province	C		1				
Kwangtung Province	C						[3] 21
Canton	C	73	229	164		64	
India	C	3,930	5,302	3,056			
Calcutta	C	294	361	79	149	128	78
Chittagong	C	2			1		
Madras	C	2					
Indochina (French): Cochin-china	C		18			[4] 298	
Chaudok	C		10			[4] 9	
Mytho	C		6			[4] 26	
Saigon-Cholon	C					[4] 8	
Thailand (Siam)	C	1,279					
Bangkok	C	308					

[1] Suspected.
[2] Deaths.
[3] For the month of April 1946.
[4] For the period April 11-20, 1946.

PLAGUE

[C indicates cases; P, present]

Place		January-February 1946	March 1946	April 1946—week ended— 6	13	20	27
AFRICA							
Algeria	C		2				
Bechuanaland	C		[1] 10				
Belgian Congo	C	2					
British East Africa:							
Kenya	C	7			5	1	
Uganda	C	7					1
Egypt	C	11	15	5	6	8	7
Alexandria	C	6	8	1	2	4	7
Ismailiya	C		4	4	4	4	
Port Said	C	1					
Suez	C	4	3				
Madagascar	C	80	35		[2] 4		
Union of South Africa	C					1	
ASIA							
Burma	C	20	256	62			
Rangoon	C	2	22	11			
China:							
Chekiang Province	C	52		64	3		
Fukien Province	C	[3] 298	200				
Foochow	C		96				
Kwangtung Province	C			1			
Yunnan Province	C		11				
India	C	5,768	2,573	876			
Manchuria	C		[4] 52				
Mukden	C		[4] 39				
Palestine	C	12	1				
Thailand (Siam)	C	15					
EUROPE							
Great Britain: Malta	C	1	1				
Portugal: Azores	C	[5] 10					
SOUTH AMERICA							
Bolivia:							
Santa Cruz Department	C	12					
Tarija Department—Plague-infected rats		P					
Ecuador: Loja Province	C		6				
Peru:							
Lambayeque Department	C	1	7				
Lima Department	C	15	3				
OCEANIA							
Hawaii Territory: Plague-infected rats [6]		4					

[1] For the period Jan. 1 to Mar. 13, 1946.
[2] For the period Apr. 1–10, 1946.
[3] Deaths reported for the period Feb. 1 to Mar. 6, 1946.
[4] Pneumonic plague.
[5] Includes 2 cases of pneumonic plague.
[6] Plague infection was also proved positive on Feb. 5, 1946, in a pool of 29 rats and on Apr. 13, 1946, in a pool of 54 fleas and 15 lice collected from 7 rats and 22 mice.

SMALLPOX

[C indicates cases; P, present]

Place		January-February 1946	March 1946	April 1946—week ended— 6	13	20	27
AFRICA							
Basutoland	C	6					
Belgian Congo	C	[1] 345	[1] 232	[1] 125			
British East Africa:							
Kenya	C	208	94	31		6	16
Nyasaland	C	44	12		19	60	
Tanganyika	C	783	713				
Uganda	C	101	141	10	12		
Cameroon (French)	C	27	13			[2] 18	
Dahomey	C	288	521			[2] 97	
Egypt	C	83	33	16	17		
French Equatorial Africa	C	84	28				
French Guinea	C	88	279			[2] 165	
French West Africa: Dakar District	C	14	16			[2] 7	
Gambia	C	1	1				
Gold Coast	C	526	67	9			
Ivory Coast	C	193	111			[2] 166	
Libya	C	30	7	2	2	5	1
Morocco (French)	C	914	349			[2] 189	
Morocco (Int. Zone)	C	79	50				
Nigeria	C	1.599	[3] 715				
Niger Territory	C	169	77			[2] 61	
Rhodesia:							
Northern	C	186	30	1	4		
Southern	C		1				
Senegal	C	12	51		[4] 5		
Sierra Leone	C	161	89	16			
Sudan (Anglo-Egyptian)	C	2	11		6		
Sudan (French)	C	1,087	456			[2] 118	
Togo (French)	C	27	20			[2] 84	
Tunisia	C	27	3				
Union of South Africa	C	71	P	P			P
ASIA							
Arabia	C					1	
Burma	C	74	344	138			
Ceylon	C	261	48	13	10		
China	C	165	154			[2] 93	
India	C	20,046	8,878				
Indochina (French):							
Cochinchina	C	12	50		[4] 13		
Laos	C	9					
Iran	C	3	4				
Iraq	C	2		1		2	
Japan	C	495					
Palestine	C		1				[5] 1
Syria and Lebanon	C		7				
Thailand (Siam)	C	7,271					
Turkey (See Turkey in Europe).							
EUROPE							
Czechoslovakia	C	24					
France	C	6	7				
Gibraltar	C	[5] 1					[5] 1
Great Britain:							
England and Wales	C	[6] 9	[6] 13	[6] 7	[5] 1	1	
Scotland	C		[6] 2				
Greece	C		96	16		1	
Italy	C	164	16			[2] 31	
Portugal	C	5	9		1	2	1
Turkey	C	7	3				1
NORTH AMERICA							
Canada	C	2					
Guatemala	C	51					
Honduras	C		3				
Mexico	C	93	37				
SOUTH AMERICA							
Argentina	C	50					
Bolivia	C	109					
Brazil	C	[1] 10	[1] 1				
Colombia	C	195	20				
Ecuador	C	6	3				
Peru	C	23					
Uruguay	C	9					
Venezuela	C	[1] 318	[1] 78				
OCEANIA							
Hawaii Territory	C		[7] 1				

[1] Alastrim.
[2] For the period Apr. 1–20, 1946.
[3] For the week ended Mar. 2, 1946.
[4] For the period Apr. 1–10, 1946.
[5] Imported.
[6] Includes imported cases.
[7] Off-shipping.

TYPHUS FEVER *

[C indicates cases; P, present]

Place		January-February 1946	March 1946	April 1946—week ended—			
				6	13	20	27
AFRICA							
Basutoland	C	1	1				
Belgian Congo [1]	C	902	478	50			
British East Africa: Kenya	C	9	3	1			
Egypt	C	598	316	28	44		
Eritrea	C	90	95	28	5	34	
Libya	C	10	12		1	2	1
Morocco (French)	C	914	717			[2] 488	
Morocco (Int. Zone)	C	3	20	9			
Morocco (Spanish)	C	1					
Nigeria	C	13	6				
Sierra Leone [1]	C	2	1				
Tunisia [1]	C	65	61		[3] 36		
Union of South Africa [1]	C	52	P	P			P
ASIA							
Arabia [4]	C	1					
China	C	11	10	2		1	
India	C	58	4	178			
Indochina (French)	C		2				
Iran	C	32	36				
Iraq	C	17	25	16	7	3	9
Japan	C	128					
Palestine [4]	C	12					
Syria and Lebanon	C	30	11	10	6		4
Trans-Jordan	C	1	10	3			
Turkey (See Turkey in Europe).							
EUROPE							
Austria	C	17	8	1			
Bulgaria	C	200	267	35		37	
Czechoslovakia [1]	C	327	136	29			
France	C	8					
Germany	C	763	980	28	9	14	
Great Britain: Malta [4]	C	7					
Greece [1]	C	56	30	5	5	108	
Hungary	C	189	128	51	58	51	
Italy	C	6					
Netherlands	C	15					
Poland	C	1,200	519	106	67	50	
Portugal	C	1	1				
Rumania	C	568	1,021	613			
Spain	C		1		1		
Turkey	C	403	271		66	60	35
NORTH AMERICA							
Costa Rica [4]	C	21		4	3		6
Cuba [4]	C	3	1				
Guatemala	C	120					
Jamaica [4]	C	8	4				
Mexico	C	217	127				
Panama (Republic)	C	1					
Puerto Rico [4]	C		2	4	1	5	
Virgin Islands [4]	C	1					
SOUTH AMERICA							
Argentina	C	1					
Bolivia	C	36					
Colombia	C	27					
Ecuador [1]	C	169	87				
Paraguay	C	1					
Peru	C	52					
Venezuela [1]	C	22	15				
OCEANIA							
Australia [4]	C	[5] 33	9				
Hawaii Territory [4]	C	12	3	1			

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Includes cases of murine type.
[2] For the period Apr. 1–20, 1946.
[3] For the period Apr. 1–10, 1946.
[4] Murine type.

YELLOW FEVER

[C includes cases; D, deaths]

Place		January—February 1946	March 1946	April 1946—week ended—			
				6	13	20	27
AFRICA							
Nigeria: Ibadan	C					[1] 1	
SOUTH AFRICA							
Bolivia: Santa Cruz Department	D	[1] 39	[1] 1				
Colombia: Caqueta Territory	D		1				
Venezuela:							
Tachira State	C	2	2				
Trujillo State	C	3	1				
Zulia State	C	4					

[1] Suspected.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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TUBERCULOSIS CONTROL ISSUE NO. 4

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Public Health Reports

Vol. 61 JUNE 7, 1946 *No. 23* *

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EDITORIAL [1]

BCG VACCINATION AGAINST TUBERCULOSIS

The results of BCG [2] vaccination reported in international medical literature have not been uniformly satisfactory, nor have they gained wide acceptance. Furthermore, there has been considerable variation in methods of application and in the population groups served. Careful review of the voluminous literature on the subject since the initial work of Calmette and Guerin in Paris in 1920 fails to reveal irrefutable evidence of the vaccine's effectiveness. Several of the studies in the Scandinavian countries and in South America suggest a relationship between vaccination and decreased incidence of the disease among children over a short period of time. Analysis of these researches, however, shows no valid statistical proof of long-time benefits.

Briefly, the advocates of BCG vaccination have formulated their rationale in this fashion: the virulence of bovine tuberculosis bacilli is first reduced by special cultural procedures; then the vaccine is introduced into tuberculin-negative infants and children. The introduction of these attenuated organisms initiates a benign and self-limiting infectious process which rather rapidly produces a variable degree of resistance against virulent strains of bovine and human tubercle bacilli.

The opponents of BCG vaccination emphasize the dangers of such deliberate imposition of infection, no matter how benign, and insist that only infected persons get tuberculosis and, furthermore, that this induced infection does not give significant immunity. Indeed, this group asserts that persons who have been infected early in life are those who die from tuberculosis later in life.

Up to the present, the use of BCG has been limited in its application mostly to persons in areas of high tuberculosis mortality. The inadequacy or the complete absence of isolation facilities and other

* This is the fourth of a series of special issues of PUBLIC HEALTH REPORTS devoted exclusively to tuberculosis control, which will appear the first week of each month. The series began with the Mar. 1, 1946, issue

[1] From the Office of the Chief, Tuberculosis Control Division.

[2] Bacillus of Calmette and Guerin.

control measures in such places made it imperative that persons who were constantly subject to massive exposure to tuberculosis should have some means of protection. In the United States, however, the relative availability of sanatoria in many areas has minimized the need for an immunizing campaign, and epidemiological studies, particularly analyses by such scholars of public health as Wade Hampton Frost, raised pertinent questions as to the permanent value of vaccination against tuberculosis. These studies showed that cohorts of such high mortality years as 1880, 1890, 1900, and 1910 made up the highest point of the statistical curve of tuberculosis deaths in 1930. In other words, those persons who apparently had the greatest exposure and, by implication, the highest infection rate in their early years, and yet survived, came to death from tuberculosis in middle age. It is recognized, however, that the intensity and amount of this internal infection with virulent tubercle bacilli may well have been greater than the artificial and measured inoculation with attenuated organisms used in BCG vaccination. The total effect of the vaccine on tuberculosis must await the day when a reduction in morbidity and mortality can be precisely measured.

The first article in this issue presents statistical evidence of the efficacy of BCG for the first 6 years of vaccination among American Indians, and implies at least that vaccination might be useful among other infected groups especially where there is little chance of isolation. These groups would include nurses and other young employees in general hospitals and sanatoria where exposure is great and standards of care may not always permit protection.

Although we are looking to chemotherapy for striking results in the future, it appears from the present study that the use of BCG vaccination should be seriously considered for limited protection of heavily exposed groups. Such practice should not interfere with or delay the search for a drug or antibiotic which will be effective against tuberculosis. When such a discovery is made, the synergistic effect of a practicable vaccine and a potent antibiotic could be explored, for the ultimate benefit of the innumerable contacts of the tuberculous population.

EXPERIENCE WITH BCG VACCINE IN THE CONTROL OF TUBERCULOSIS AMONG NORTH AMERICAN INDIANS

By Joseph D. Aronson [1] and Carroll E. Palmer [2]

By 1935 the combined evidence from world-wide studies indicated that BCG [3] vaccine might be an effective preventive against tuberculosis, and consideration was given to utilizing it to reduce the high

[1] From the Health Division, Office of Indian Affairs, Department of the Interior, Washington, D. C., and the Henry Phipps Institute, University of Pennsylvania, Philadelphia.
[2] From the Field Studies Section, Tuberculosis Control Division, U. S. Public Health Service.
[3] Bacillus of Calmette and Guerin.

incidence of the disease among North American Indians. However, since there was uncertainty at that time about the validity of many of the reports on the subject, it was decided to conduct first a controlled study of the value of the vaccine rather than an uncontrolled broad-scale program of vaccination.

A preliminary summary of the results of the first 3 years of the study has been reported in a previous paper.[4] The present report is based on observations made during 3 additional years. Differences in the morbidity from tuberculosis between the preliminary report and the present one are accounted for by changes made as a result of subsequent examinations and, to some extent, by changes in definitions and interpretations.

Design of the Study

Briefly, the general plan of the study first involved the selection of a group of Indian children and young adults, living on different reservations and communities in various parts of the United States and Alaska, who were free from tuberculosis as indicated by their failure to react, definitely, to a maximum dose (0.005 mg.) of a standardized tuberculin PPD. Second, a random portion of the negative reactors was vaccinated intracutaneously with freshly prepared BCG vaccine, while the remainder served as controls. Systematic annual follow-up of the two groups by means of X-ray films of the chests, tuberculin tests, and histories of exposure to tuberculosis, was then instituted to determine the effectiveness of the BCG vaccine in preventing the development of tuberculosis. An outline of the name and location of the reservation, date of tuberculin testing, vaccination, times of annual re-examination, year last examined, and years of observation is presented in table 1.

The present report is based on a study of 3,007 Indian persons ranging in age from 1 to 20 years, inclusive. One thousand five hundred and fifty of these persons were vaccinated with a single dose of either 0.1 or 0.15 mg. of one of 13 different, freshly prepared lots of BCG vaccine. The remaining 1,457 were injected with 0.1 cc. of sterile physiological salt solution. No change in the living conditions of the persons in the study, including exposure to tuberculosis, was made either at the beginning or during the study.

The study was conducted on 4 widely scattered reservations in the United States and in 12 communities of southeastern Alaska. The field study was initiated in December 1935, and it was not until February 1938 that the initial tuberculin tests to select the study group and the vaccinations were completed. The interval from the time of the initial tuberculin tests to the time of injection of the vaccine or

[4] Townsend, J. G.; Aronson, Joseph D.; Saylor, Robert; and Parr, Erma I.: Tuberculosis control among North American Indians. Am. Rev. Tuberc., 45:41–52 (1942).

TABLE 1.—*Outline of field work and time schedule of BCG study, by reservation*

Reservation [1]	Time of—			Year last observed	Number of years covered
	Initial tuberculin	Vaccination	Yearly visit		
Pima, Ariz.:					
Group A [2]	December 1935–February 1936.	February–March 1936.	March–May	1944	8
Group B	December 1936–January 1937.	February 1937	March–May	1944	7
Wind River, Wyo.:					
Shoshone	May–June 1936	June 1936	September–November.	1943	7
Arapaho	May–July 1936	July 1936	September–November.	1943	7
Turtle Mountain, N. Dak.:					
Chippewa	September 1936	October 1936	May–August	1944	8
Marty Mission	September 1937	October 1937	May–September	1944	7
Rosebud, S. Dak.	September 1937	October 1937	September–October.	1943	6
Southeastern Alaska	September 1937–January 1938.	January–February 1938.	December–February.	1944 (February).	6

[1] The term "reservation" is used in a broad sense to cover the several types of Indian groups which are actually reservations, tribes, school, or geographic region, as the case may be.
[2] A and B are designations for groups started in succeeding years.

physiological salt solution averaged 6 weeks, with a maximum interval of 21 weeks.

With relatively few exceptions, an initial X-ray film of the chest was made sometime during the interval of time between the initial tuberculin test and the vaccination or saline injection, or as soon thereafter as practicable. Four persons, three vaccinated and one control, were excluded from the study, since roentgenologically demonstrable, pulmonary lesions that suggested tuberculosis were noted in films that had been made between the time of the original negative tuberculin reaction and the time of the injection of the BCG vaccine. Despite the presence of the pulmonary lesions, those persons who were injected with the vaccine failed to show a Koch phenomenon. The decision to exclude these four persons was made, because it was intended that only persons free of tuberculosis at the beginning of the study be included, and because the same criterion for exclusion was applicable to members of both the BCG and control groups. There were two additional persons among the BCG vaccinated group who gave indication of tuberculous infection at the start of the program. This indication was a Koch phenomenon 48 hours after vaccination. One of these persons died of tuberculous meningitis less than 3 months later. Some consideration was given to eliminating these persons from the study, but since there was no similar method of detecting tuberculosis in the control group, they were not excluded.

The sites of the intracutaneous injection of both the vaccine and the physiological salt solution were examined 48 hours following the injection in order to observe the character of the local inflammatory reaction and to discover the occurrence of a Koch phenomenon. Subse-

quent observations were made over a period of several weeks in order to collect data on the character of the inflammatory reaction, ulceration, involvement of the regional axillary nodes and to note the occurrence of subjective symptoms. The variation in the character of the local inflammatory reaction and ulceration following the intracutaneous injection of BCG vaccine has been reported previously.[5] In no instance, however, was surgical intervention necessary in the treatment of the local ulcer; regional nodes did not ulcerate; nor did any of the vaccinated persons develop significant subjective symptoms.

Re-examination of the BCG vaccinated and control groups was made at approximately annual intervals by the members of the Tuberculosis Control Unit, assisted by the local Indian Service field nurses. Excellent cooperation was obtained on the reservations through meetings with members of the Tribal Council and with parents in their local Parent-Teacher groups. The importance of re-examination was emphasized and, in consequence, a high percent of those included in the study were re-examined year after year. World War II, however, made it impractical to follow many of the persons who had either entered the armed forces or had moved to centers of war industry. For this reason and because of the shortage of trained personnel, the annual re-examination was temporarily discontinued in September 1944. At that time six annual examinations had been made on all reservations and communities while seven or eight re-examinations had been completed in others.

At the time of the annual examination, which usually was conducted at the local school, the persons in the study were retested with 0.00002 mg. of PPD. Those who failed to react to this dose were reinjected 48 hours later with 0.005 mg. of the same preparation of PPD. At the same time a roentgenological examination of the chest was made by means of a mobile X-ray unit which was part of the equipment of the Control Unit. The films which were developed at each reservation or community were interpreted by the radiologist of the Tuberculosis Control Unit. No film was identified in any manner as being from a vaccinated or control person. The results of the roentgenological examination and the tuberculin test were entered on the individual record card from which compilations were made. In the interval between the annual examinations, the field nurse maintained a record of the occurrence of any intercurrent disease as well as a record of known exposure to tuberculosis.

In 1945, Dr. H. B. Zwerling, radiologist of the Field Studies Section of the Tuberculosis Control Division of the United States Public Health Service, who had not been associated, in any capacity, with the study, reviewed each set of serial films without reference to the tuberculin test or clinical record, and without knowledge of whether

[5] Aronson, Joseph; Parr, Erma I., and Saylor, Robert M.: BCG vaccine, its preparation and the local reaction to its injection. Am. Rev. Tuberc., 42: 651–666 (1940).

the subject was in the BCG or control group. The method of combining the results of Dr. Zwerling's readings with the field interpretations is described below.

Methodology

Adequacy of Samples

The validity of any conclusions which may be drawn from the study is obviously dependent on the comparability of the vaccinated and control groups. It is, of course, not possible to be certain that no bias was, unintentionally, introduced. Nevertheless, some tests of the material for factors known to be pertinent to the study may be made. The factors considered are age, the percent re-examined annually, and degree of exposure to tuberculosis.

In table 2 and figure 1 it may be seen that the age distribution of the children in the BCG group is essentially the same as that of the control group.

TABLE 2.—*Age distribution of persons in the BCG study (attained age at beginning of study)*

Age (in years)	Number		Percentage	
	BCG	Control	BCG	Control
Under 1	104	107	6.7	7.3
1	82	93	5.3	6.4
2	89	75	5.7	5.1
3	87	71	5.6	4.9
4	71	68	4.6	4.7
5	100	93	6.5	6.4
6	157	137	10.1	9.4
7	153	139	9.9	9.5
8	139	129	9.0	8.9
9	111	125	7.2	8.6
10	110	97	7.1	6.7
11	89	85	5.7	5.8
12	78	79	5.0	5.4
13	65	57	4.2	3.9
14	43	33	2.8	2.3
15	32	32	2.1	2.2
16	22	20	1.4	1.4
17	7	10	.5	.7
18	9	3	.6	.2
19	2	3	.1	.2
20		1		.1
Total	1,550	1,457	100.0	100.0

The percentage of persons tuberculin tested during the 6 years of the program is shown in tables 3 and 4. These tables indicate the degree of completeness of follow-up in two ways: (1) Table 3 gives the percentage of children actually tuberculin tested each year; (2) table 4 shows the percentage of living children who are known to have been in the study each year. Table 3 somewhat understates the degree of completeness of the follow-up, since there was a number of persons who were missed in one year but who were re-tested in subsequent years. Table 4 takes this factor into account, and also eliminates the factor of deaths which contributes to the smaller percentages in table 3.

The degree of completeness of the follow-up was essentially the same in the control and vaccinated groups, as may be judged from the almost identical percentages shown in both the tables. Furthermore, it may be noted that at least until the sixth year of the program, substantially more than 90 percent of the original study group was

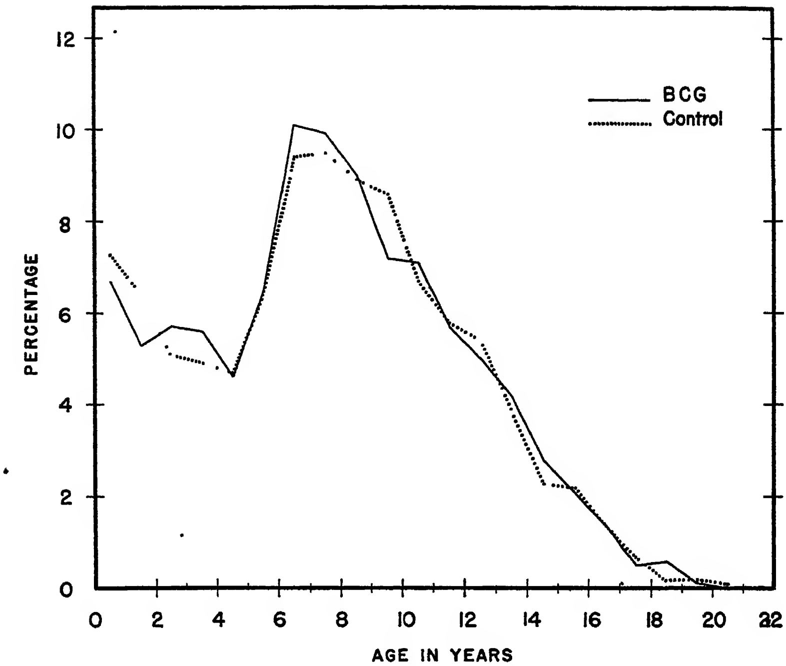

FIGURE 1.—Age distribution of persons at beginning of study, for BCG and control groups.

TABLE 3.—*Percentage of all persons in BCG study, tuberculin tested, by years from beginning of study*

Group	Year					
	1	2	3	4	5	6
BCG	94.5	92.4	93.2	92.5	88.2	77.5
Control	89.9	92.2	93.5	90.7	86.6	74.3

TABLE 4.—*Percentage of living persons remaining in the study each year* [1]

Group	Year					
	1	2	3	4	5	6
BCG	99.4	98.8	98.3	97.4	93.4	83.4
Control	99.0	99.4	98.2	96.1	92.4	82.5

[1] The percentage given is 100 minus the percentage of living persons permanently missing from the study.

still under observation. The decrease in the sixth year, to about 83 percent, is attributable to factors related to the war.

The validity of the conclusions, with respect to the effectiveness of the vaccine, depends not only on the design of the program and on the methods of analysis but also on whether the members of the vaccinated group experienced the same degree of exposure to tuberculosis as

those in the control group. The history of contact of each member of the program with tuberculous persons during the period of the study was evaluated in terms of degree of intimacy of contact and the type of case. Intimacy varied from sleeping in the same room regularly with a person who has infectious tuberculosis to visiting occasionally in the house of a person with the disease. Type of case varied from a sputum-positive to a probable or arrested case of tuberculosis. These factors were combined to assign a rating (1+, 2+, or 3+) to each individual having exposure or contact. The highest rating, 3+, was limited to "very intimate contact with a sputum-positive case." The standards for classification of each individual as to degree of exposure were admittedly arbitrary. However, the important fact is that the ratings were made without knowledge of whether the individual had been vaccinated.

Table 5 reveals the fact that the members of the vaccinated and control groups were exposed to tuberculous infection to essentially the same extent. Approximately 20 percent of the personnel of both groups were exposed, and the distribution as to degree was very similar. This may be observed by comparing the percentages of persons who had 3+, 2+, and 1+ degrees of exposures. Furthermore, the figures for each reservation show excellent correspondence between the total exposed in the BCG group versus the total exposed in the control group. There is even a remarkable similarity between the distribution as to degree of contact at each reservation. The conclusion, therefore, is that the factor of exposure to tuberculosis probably produced no bias in the outcome of the study of the value of the vaccine.

Ordinarily one method of estimating whether the control group is adequate would be in terms of its total mortality experience in relation to that of the general population from which the control group was

TABLE 5.—*Number of persons in BCG study and percentage having different degrees of exposure to tuberculosis, by reservation*

Reservation	BCG group					Control group				
	Number persons in study	Percentage				Number persons in study	Percentage			
		Total exposed	Degree of exposure[1]				Total exposed	Degree of exposure[1]		
			3+	2+	1+			3+	2+	1+
Pima A	259	10.8	5.4	3.5	1.9	263	9.5	4.9	3.4	1.1
Pima B	95	10.5	4.2	3.2	3.2	86	8.1	3.4	4.7	------
Shoshone	110	22.7	12.7	7.3	2.7	85	17.6	3.5	10.6	3.5
Arapaho	118	31.4	2.5	23.7	5.1	106	22.6	3.8	13.2	5.7
Chippewa	170	22.9	2.9	13.5	6.5	162	24.1	3.1	12.3	8.6
Marty	41	19.5	2.4	12.2	4.9	25	16.0	4.0	8.0	4.0
Rosebud	260	16.2	4.6	6.2	5.4	266	16.5	4.1	5.3	7.1
Alaska	497	28.8	3.0	18.3	7.4	464	28.2	4.1	15.9	8.2
Total	1,550	21.4	4.4	11.8	5.2	1,457	19.8	4.0	10.0	5.8

[1] 3+ indicates the greatest degree of exposure.

selected. This, however, could not be accomplished in this study, because of the known inadequacies of the reporting of vital statistics for the Indian population. When dealing with a group where reporting is poor, the death rates obtained by intensive follow-up are expected to exceed those obtained from routine vital statistics reports.

Method of Analysis

In the main, the object of a study on BCG is to determine whether or not the immunized individual is protected from tuberculosis. Faced with this objective, the investigator must define what is to be meant by the term "tuberculosis." Depending on the point of view, tuberculosis may include such a mild manifestation of infection as a positive tuberculin reaction alone or extensive local or generalized disease accompanied by demonstrable, virulent organisms. Further, evidence provided in any given study is limited by the extent and type of observations made. If the material consists of complete and frequent clinical observations, extensive laboratory investigations, as well as frequent skin tests and frequently repeated radiological examinations, it would be possible to analyze the material in such a way as to evaluate the effectiveness of the vaccine according to different definitions of tuberculosis. In the present study such complete data are not available. Principally, the information for analysis consists of annual observations on the tuberculin reaction and annual X-ray films of the chest, with only limited clinical and laboratory data.

Aside from a comparison of the vaccinated and control groups with respect to deaths from tuberculosis and cases of extrapulmonary tuberculosis, the evaluation which may be made from the present study must be directed to the effectiveness of BCG in preventing pulmonary lesions characteristic of tuberculosis that appear on serial X-ray films. These "cases" can be subdivided into several categories according to the extent and character of X-ray findings.

The frequency of "cases" so selected may, for comparative purposes, be considered an index of the true incidence of tuberculosis. The use of such an index is not a serious limitation, for it may be assumed that a large majority of actual cases of tuberculosis, by any criteria, will be found among those in this selected group of cases. Furthermore, since there are no reasons for believing that similar considerations are not applicable to both the BCG and control groups, the comparisons of the two groups based on this index should be valid.

In view of the above considerations, the effectiveness of vaccination is determined by comparing the two groups, from which the cases were selected, in terms of the following categories:

1. Total deaths.
2. Deaths due to tuberculosis.
3. Extrapulmonary tuberculosis.
4. Moderately and far-advanced pulmonary.

5. Minimal.
6. Enlarged hilar glands:
    (a) With parenchymal lesions.
    (b) Without parenchymal lesions.
7. Pleural effusion.

Procedure of X-ray Interpretation

The first step in the identification of cases consisted of a review of all chest films on each individual. Such films as revealed parenchymal lesions characteristic of tuberculosis, or enlargements of hilar lymph nodes, were selected for further review. The second step was to compare these interpretations with those made annually in the field during the course of the study, retaining for further review only cases in which suspicious shadows were observed in both readings. On some of these cases, clinical and laboratory data were available to establish a diagnosis of tuberculosis. For the remaining group of cases, the data on the tuberculin reaction were used to confirm the X-ray findings.

It was arbitrarily required for the cases in this study that the tuberculin reaction be positive to the first dose (0.00002 mg.) at the time of the positive X-ray film. Exception to this rule was made in a relatively small number of cases where the tuberculin reaction became positive to the first dose in the year following the first positive X-ray film (providing the X-ray evidence was not of pleural effusion alone).

For cases classified as pleural effusion it was required not only that the tuberculin reaction be positive to the first dose in the year of the indicated involvement, but also that it must not have been positive longer than a year.

It is recognized that the significance of the tuberculin reaction is different for the control than for the BCG group. Details of the differences between the control and vaccinated groups, with respect to changes in the tuberculin reactions were published in a previous paper.[6] In general, the tuberculin reaction becomes positive after vaccination. Approximately 37 percent of the persons in the BCG group reacted to the first dose and 56 percent to the second dose 1 year after vaccination. Among persons in the control group, however, only 7 percent reacted to the first and 5 percent to the second dose at the end of the first year of the program. In using the tuberculin reaction as a criterion in the diagnosis of a case the conservative view is being taken. In other words, because there are more reactors to the first dose of tuberculin among the vaccinated group than among the control group, more nontuberculous individuals would be called cases among the BCG than among the controls on the basis of the tuberculin criterion.

[6] Aronson, J. D.; Parr, E. I., Saylor, R. M.: The specificity and sensitivity of the tuberculin reaction following vaccination with BCG. Am. J. Hyg., 33; 42–49 (March 1941).

Results

Total Mortality

The most striking comparison that can be made between the BCG and control groups, and the one least subject to diagnostic variation, is that between the total number of deaths in the two groups. Among the controls there were 60 deaths from all causes during the 6-year period as compared with only 34 in the BCG group. This comparison becomes even more significant when the populations of the two groups are considered. There were, as was noted previously, only 1,457 members in the control group while those in the BCG numbered 1,550. The former contributed 8,367 person-years of experience, while the latter contributed 8,977. In terms of deaths per 1,000 person-years of experience the death rate in the BCG group was 3.8 while that for the control group was 7.2. This comparison assumes that there was no difference in the members of the BCG and control groups, with respect to their inherent vitality. As far as is known, the method of selection of the two groups should have precluded any such differences.

It should be noted that such favorable results could not be expected in populations where the tuberculosis mortality rate is relatively low. The reason for the very favorable results in terms of the mortality shown above can be explained only because the tuberculosis mortality rate among the Indians is very high and deaths from tuberculosis in these ages compose a very large proportion of deaths from all causes.

Tuberculosis Mortality

Actually, the difference in the number of deaths attributed to tuberculosis in the 2 groups was not quite so large as the difference in total deaths. The reason for this may be that in the control group some of the deaths which were assigned to nontuberculous causes may actually have been a consequence of tuberculosis. Whether this be true or not, comparison between the BCG and control groups in the deaths which were attributed to tuberculosis is sufficiently striking. Among the members of the control group there were 28 deaths from tuberculosis,[7] while among the members of the vaccinated group there were only 4 such deaths. All 4 of the deaths in the BCG group occurred in cases which had their onset during the first 2 years of the study, while the 28 deaths in the control group were distributed fairly evenly among cases developing throughout the whole 6-year period.

Morbidity

General considerations.—In presenting the analysis of morbidity between BCG and control groups, it is desirable to give separate comparison for the different classes of cases that can be distinguished,

[7] Three of these deaths occurred after the 6-year period of study, although onset of the disease was within the period. No such deaths occurred after the study period in the vaccinated group.

principally, on the basis of roentgenographic evidence. Table 6 gives the results of such a comparison between the vaccinated and control groups.

TABLE 6.—*Distribution of cases and deaths from tuberculosis according to type of case at time first observed and at most severe stage observed*

Type of case [1]	Cases [2]				Tuberculosis deaths			
	At time first observed		At most severe stage observed		By type of case as first observed		By type of case at most severe stage observed	
	BCG	Control	BCG	Control	BCG	Control	BCG	Control
Enlarged hilar glands	21	122	19	99	3	14	--------	--------
With a parenchymal lesion	13	92	11	74	--------	13	--------	--------
Without a parenchymal lesion	8	30	8	25	--------	1	--------	--------
Minimal	10	29	8	20	--------	4	--------	--------
Advance [3]	1	2	6	29	--------	1	2	12
Extrapulmonary [4]	2	8	3	19	1	8	2	16
Pleural effusion	6	24	4	18	--------	1	--------	--------
Total	40	185	40	185	4	28	4	28

[1] Type as determined by X-ray diagnosis, except for extrapulmonary cases.
[2] Includes deaths from tuberculosis.
[3] Includes moderately and far advanced cases.
[4] Includes intestinal, military, osseous, meningeal tuberculosis, and tuberculous cervical adenitis.

During the 6-year period of observation many of the cases did not remain in the same category throughout the time during which they were followed. Table 6 shows, therefore, the distribution of both cases and deaths in two ways: (1) The type of case at the time first observed, and (2) the most severe or advanced stage of the disease that was observed during the period of the study. The following comparisons will be based on the latter.

Of the moderately and the far-advanced pulmonary and the extrapulmonary cases, there was a total of 48 in the control compared with 9 in the BCG group. Excluding deaths which occurred among those in this classification of cases, 20 were in the control and 5 in the vaccinated group, giving a ratio of 4:1, in favor of the BCG group. In the minimal group there were 20 cases in the control and 8 in the BCG group. For pleural effusion, the respective numbers were 18 and 4. For cases in which the X-ray evidence was that of enlarged hilar glands, there were 99 in the control and 19 among the BCG; among those with parenchymal lesions the numbers were 74 and 11; and among those without parenchymal lesions comparable figures were 25 and 8 respectively.

Total incidence.—Since the comparisons shown above indicate that the benefit to the BCG group was not confined either to tuberculosis deaths or to any special diagnostic category, it is considered justifiable to present the analysis which follows in terms of total incidence of cases. This includes cases and all deaths from the disease.

The total number of cases, as defined in this way, was 185 in the control group and 40 in the BCG group. Expressed in terms of 1,000

person-years of life, the total incidence was 24.3 in the control and 4.7 in the vaccinated group. The rate for the controls was, therefore, 5.2 times that of the vaccinated.

It may be well at this point to note that the use of the supplemental data on the tuberculin reaction in defining a case had relatively little effect on the comparisons presented above. If a positive reaction to the first dose of tuberculin were not made a prerequisite, and the classification made on the appearance of the shadows on the X-ray films alone, there would have been 26 additional cases—13 in each group, of which 9 in the BCG group and 10 in the control group were pleurisy cases. On this basis the comparison of total incidence between the BCG and control groups would have been that of 53 against 198, instead of 40 against 185 where the tuberculin criterion is used.

Total incidence by years from vaccination.—In addition to the general findings that vaccination is associated with a reduction in the incidence, it is of considerable importance to review the data with respect to the time interval from vaccination to onset of disease. For example, it becomes important to determine whether or not the protection afforded by vaccination changes with time. Information bearing on this subject is provided in tables 7 and 8, and figure 2.

Table 7 presents, by year after vaccination, the number of new cases observed at the time of the annual examinations.

TABLE 7.—*Number of cases and deaths, by years from the beginning of BCG study to time of first observation of case*

Years	Cases[1]		Deaths[2]	
	BCG	Control	BCG	Control
1	18	37	2	6
2	9	32	2	7
3	3	31		5
4	6	33		6
5	3	26		2
6	1	26		2
Total	40	185	4	23

[1] Includes deaths.
[2] By year of first observation of case.

Even a casual review of the number of cases developing each year reveals that there has been certainly no reduction in the protection afforded by vaccination during the 6-year period of observation. About half as many cases (18:37) developed in the BCG group as in the control group during the first year. During the second year, the ratio improved to approximately one-quarter (9:32), and for the last year the ratio declined to 1:26.

A more precise analysis of the incidence of tuberculosis by years from vaccination is shown in table 8. The data given there compensates for the difference in the number of persons in the BCG and

TABLE 8.—*Life table experience: Determination of annual incidence of cases (by years from beginning of BCG study)*

Year	Number: Lost by death or other reason	Number: Remaining in study at end of year	Number: Previously[1] counted as case	Number: In study at end of year, not case at beginning of year	Number: New cases	Average number at risk	Attack rate per 1,000 person-years
	BCG group (1,550)						
1	20	1,530	0	1,530	18	1,521	11.8
2	14	1,516	17	1,499	9	1,494	6.0
3	16	1,500	24	1,476	3	1,474	2.0
4	19	1,481	25	1,456	6	1,453	4.1
5	63	1,418	30	1,388	3	1,386	2.2
6	153	1,265	25	1,240	1	1,240	.8
	Control group (1,457)						
1	20	1,437	0	1,437	37	1,418	26.1
2	10	1,427	35	1,392	32	1,376	23.3
3	22	1,405	60	1,345	31	1,330	23.3
4	40	1,365	84	1,281	33	1,264	26.1
5	60	1,305	104	1,201	26	1,188	21.9
6	150	1,155	101	1,054	26	1,041	25.0

[1] Excludes previous cases which have dropped out of study

control groups, 1,550 and 1,457, respectively, and also takes into account the reduction in the size of both groups through the years. This is accomplished by presenting attack rates, that is, the number of new cases developing within a given year, per 1,000 persons exposed to risk during that year. This latter figure is obtained by conventional methods by eliminating the experience of all persons who have been lost from the study,[8] either because of death or other reasons, as well as those who became cases in previous years. The rationale back of the latter procedure is the fact that a person who has once become a case cannot be counted again as among those exposed to the risk of becoming attacked. For each of the years the number of persons exposed to risk is obtained by subtracting from the number of persons observed at the end of the year, one half of the number of the cases that developed during that year, on the theory that these cases have developed uniformly during the year.

The attack rates given in the last right-hand column of table 8 are shown graphically in figure 2. It may be noted that among the controls cases appeared at a nearly constant rate of around 24 per 1,000, each year of the program. By contrast with this uniform attack rate for the controls, the members of the BCG group experienced progressively lower rates of attack in successive years after vaccination. The highest attack rate in the BCG group was during the first year after vaccination (11.8 cases per 1,000); during the sixth year the rate

[8] The experience of persons who drop out of the study during a given year was eliminated in computing the average number at risk for that year since there is no prior assurance that cases which may have developed during the year in that group were more likely to have remained in the study than those who did not.

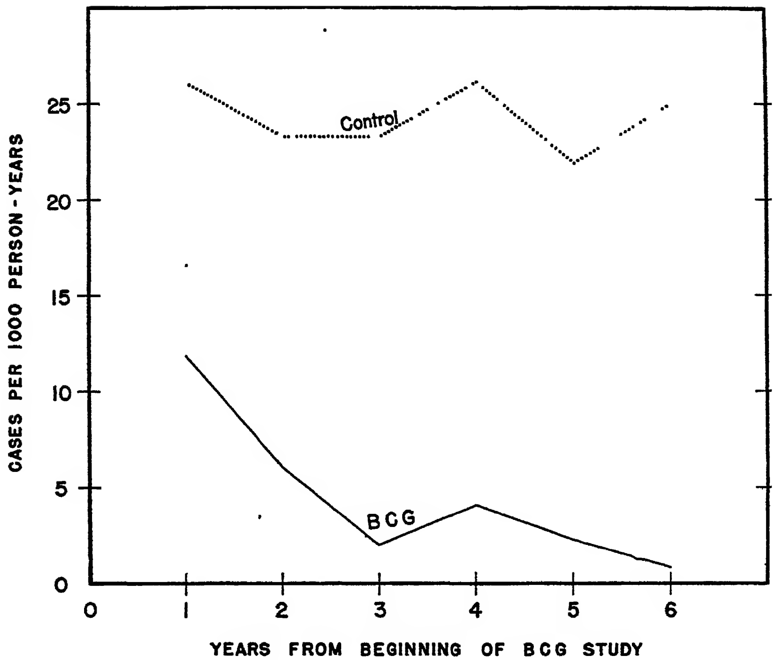

FIGURE 2.—Number of cases per 1,000 persons-years, by years from beginning of study, for BCG and control groups.

was reduced to less than 1 per 1,000. It should be noted, however, that even during the first year the attack rate for the BCG group was less than half that for the control group.

The downward trend of attack rates for the BCG group is probably slightly exaggerated in that the rate for the first year exceeds the true rate. An excess of first-year cases over the number in succeeding years in both BCG and control groups might arise from including persons having tuberculosis with onset before the beginning of the study, despite efforts to eliminate them. Further, an additional small number of cases might have developed between the time of the initial tuberculin test and the time of vaccination, which averaged 6 weeks and extended in some instances to 21 weeks.

While extraneous factors might account for a certain proportion of cases in the first year after vaccination, there still remains a definite downward trend in the attack rate in the BCG group. Even discounting the experience in the first year, there was a reduction in the attack rate from 6 per 1,000 person-years of experience the second year to less than 1 per 1,000 in the sixth year. Although no direct evidence can be offered, it is possible that the protection afforded by vaccination increases with the passage of time.

Total incidence by age.—Table 9 presents the attack rates by age,

TABLE 9.—*Number of cases, person-years of exposure and attack rates, by attained age groups*

[Cases are grouped according to the age of the person when case was first observed]

Attained ages [1]	Cases	Person-years of exposure	Attack rates per 1,000 person-years
	BCG group		
1-5	9	1,222	7.4
6-10	19	3,176	6.0
11-15	9	3,105	2.9
16-20	3	984	3.0
21-25	0	81	----------
All ages	40	8,568	4.7
	Control group		
1-5	36	1,171	30.7
6-10	63	2,734	23.0
11-15	61	2,770	22.0
16-20	23	872	26.3
21-25	2	70	28.6
All ages	185	7,617	24.3

[1] Age at time of annual examination; average age during the year of observation was 6 months less.

in 5-year age groups—that is, the number of new cases developing among the persons of a given age group per 1,000 person-years observed in that age group. Person-years of observations are accumulated without respect to year in the program, according to conventional life table procedures.

It may be observed that for the control groups the attack rate shows relatively little change with age. By contrast, in the BCG group there is a more apparent downward trend of the rates with increasing age (fig. 3). The rate for the youngest age group was 7.4 per 1,000 person-years, while the rate for persons over 15 is less than half that value.

These findings, when considered in conjunction with those from the analysis by year since vaccination, suggest that the mechanism of protection afforded by BCG is associated with the age of the individual, the interval of time after vaccination, or both these factors. Sufficient data are not available for a more satisfactory evaluation of the independent operation of these factors.

Total incidence by reservation and vaccine lot.—An analysis of the incidence of cases by reservation is given in table 10 and figure 4. The distribution for the BCG group is further detailed by vaccine lot number. (Each lot was numbered in order of preparation and some lots were used at more than one reservation.)

Because of the relatively small number of persons at some of the reservations, the more precise analysis of incidence by life-table methods was not considered to be justified. For the purposes of

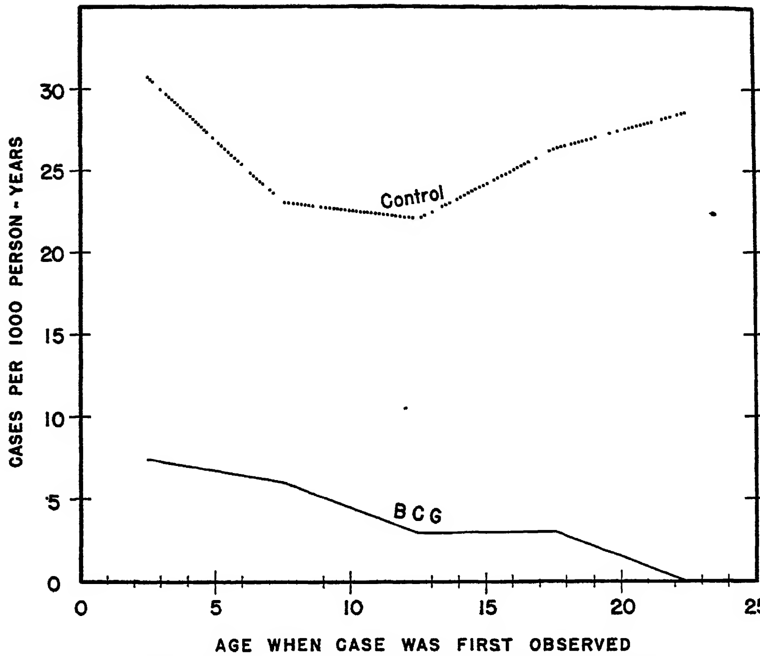

FIGURE 3.—Number of cases per 1,000 persons-years, by age at time case was first observed, for BCG and control groups.

TABLE 10.—*Number of persons in BCG study, number of cases and deaths, cases as percentage of number in study, and ratio of percentages, by reservation and vaccine lot number*

Reservation and lot number	Number: Persons in study: BCG	Number: Persons in study: Control	Number: Cases [1]: BCG	Number: Cases [1]: Control	Number: Tuberculosis deaths: BCG	Number: Tuberculosis deaths: Control	Cases as percentage of number in study: BCG	Cases as percentage of number in study: Control	Ratio of percentages: BCG / Control
Pima A	259	263	4	11	1	2	1.5	4.2	0.37
Lot 1	88		2		1		2.3		
Lot 2	171		2				1.2		
Shoshone	110	85		4		1		4.7	.00
Lot 3	98								
Lot 4	4								
Lot 5	8								
Arapaho	118	106	2	24	1	4	1.7	22.6	.07
Lot 3	3								
Lot 4	111		1		1		.9		
Lot 5	4		1				(2)		
Chippewa	170	162	2	13			1.2	8.0	.15
Lot 6	170		2				1.2		
Pima B	95	86	1	3		2	1.1	3.5	.32
Lot 7	95		1				1.1		
Rosebud	260	266	16	34	2	6	6.2	12.8	.48
Lot 8	126		11		2		8.7		
Lot 9	124		4				3.2		
Lot 10	10		1				(2)		
Marty	41	25		2		1		8.0	.00
Lot 9	41								
Alaska	497	464	15	94		12	3.0	20.3	.15
Lot 11	254		12				4.7		
Lot 12	28		1				3.6		
Lot 13	215		2				.9		
Total	1,550	1,457	40	185	4	28	2.6	12.7	.20

[1] Includes tuberculosis deaths. [2] Percentages based on less than 25 persons not shown.

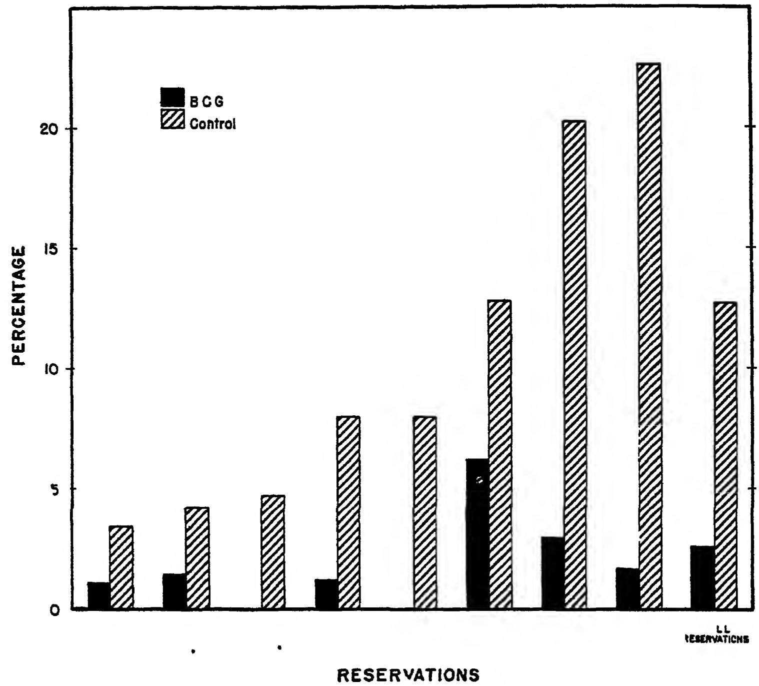

FIGURE 4.—Percentage of persons in study that became cases, by reservation, for BCG and control groups.

obtaining an indication of the effectiveness of the different lots of vaccine, it seemed sufficient to compare the cases as simple percentages of the number of persons enrolled in the program at the beginning of the study.

Since the incidence among the control group differed considerably in the different reservations (from a total incidence for the 6-year period of 3.5 percent for the Pima B series to 22.6 percent for the Arapaho tribe on the Wind River Reservation) it becomes necessary to consider the variations of the percentages for the vaccinated in conjunction with those of the controls. This is accomplished by showing, in the last column of table 10, the ratios of the percentages for the BCG groups to those for the controls.

From these ratios it appears that vaccination is associated with a substantial reduction in the incidence of cases at every reservation. The best results appear to have been obtained at the Wind River Reservation on the Shoshone and Arapaho Indians, with lots 3, 4, and 5. The incidence of cases in the BCG group at these two reservations was reduced to about 6 percent of that in the control group.

It will be noted from figure 4 and table 10 that the percentage of cases that developed among the BCG group at the Rosebud Reservation, where lots 8, 9, and 10 were used, was much higher than that at any other, while the incidence for the control group

is equal to the average for all reservations. The percentage for the vaccinated at Rosebud (6.2) is based on a large enough group (260) to be considered a significant deviation from the average (2.6 percent). Another way to describe the poor results is to say that the Rosebud personnel formed 17 to 18 percent of the total number of persons in the study and yielded 18 percent of the cases among the controls, but produced 40 percent of the cases among the vaccinated. These relatively poor results may be attributed, perhaps, to the fact that the three lots of vaccine used on this reservation were prepared from a slow-growing culture (on veal-potato media) in place of Sauton's media, and probably contained many dead organisms. Another fact of interest in this connection was the finding of slight local reactions following the injection of the vaccine, and the low degree of sensitivity to tuberculin shown by the Rosebud group 1 year later. Details relative to these latter facts are given in a previous paper (see footnote 5). The combined evidence indicated that it would have been appropriate to discard the Rosebud Reservation data as being nonrepresentative and noncomparable in the present study. The more conservative position was taken, however, and the experience for this reservation was included. Despite the substandard performance of the vaccine at Rosebud, its use had a marked effect on the incidence of cases which was only one-half as great in the vaccinated as in the control group.

Summary

The present paper gives the results of a study, begun in December 1935, on the effect of BCG vaccination on the incidence of tuberculosis among American Indians. The study group consisted of 3,007 persons, ages 1 to 20 years, who were selected from a larger group on the basis of a negative tuberculin reaction. BCG vaccine was given intracutaneously to 1,550 with 1,457 serving as controls. These persons were followed for 6 years with annual tuberculin tests and chest X-ray examinations.

Tests of the vaccinated and control groups as to age, amount of exposure to tuberculosis, and completeness of follow-up indicate that the two groups are comparable in these respects.

Results from the analysis of the records show that BCG vaccination is associated with marked protection against the development of tuberculosis as measured by mortality and morbidity experience of the two groups.

During the 6-year period, 60 deaths from all causes occurred among the 1,457 persons in the control group compared with 34 among 1,550 vaccinated. In terms of deaths per 1,000 person-years, the death rates were 7.2 and 3.8, respectively. There were 28 deaths assigned to tuberculosis among the controls as compared with only 4 such deaths among the BCG group.

Comparison of cases, as determined mainly from radiological evidence, supplemented by data from tuberculin tests, revealed similar wide differences between the two groups. Including those that died from tuberculosis, 48 cases were classified as having extrapulmonary tuberculosis or advanced pulmonary lesions among the controls while only 9 such cases were found among the vaccinated. There were 20 cases showing X-ray evidence of minimal lesions among the controls and 8 among the vaccinated. The corresponding figures for cases showing enlarged hilar glands were 99 and 19, respectively, and for pleural effusion 18 and 4, respectively.

The comparison for total incidence, cases of all types and deaths, is that of 185 among the controls and 40 in the vaccinated. In terms of cases per 1,000 person-years, the rates were 24.3 and 4.7, respectively.

There is no evidence from the analysis that a diminution of immunity occurred with the passage of time after vaccination. On the contrary, indications were that the protection may be greater in the later than in the earlier years after vaccination.

The total incidence of cases among the controls was nearly constant for all age groups, while among the vaccinated there was a marked decrease in incidence with advancing age. The evidence is suggestive, although not conclusive, that BCG vaccination may be more effective in the older than the younger children.

Some variation in the effectiveness of the different lots of vaccine was noted. Lots 8, 9, and 10 appeared to afford much less protection than the others used.

Acknowledgment

The study was initiated by Dr. J. G. Townsend, Director of Health of the Office of Indian Affairs, Department of the Interior, and was conducted cooperatively with the Henry Phipps Institute of the University of Pennsylvania, with the support of the Medical Research Committee of the National Tuberculosis Association. Dr. J. D. Aronson of the Phipps Institute was placed in charge of the study and was assisted by Dr. R. Saylor and Miss E. Parr of the Indian Service. The analysis of the data was made in cooperation with Dr. Aronson by the Field Studies Section of the Tuberculosis Control Division, United States Public Health Service, under the general direction of Dr. Carroll E. Palmer. A considerable part of the planning of the analysis and of the interpretation of the data was done by Dr. M. L. Furcolow. The preparation of the report has been the responsibility of Lawrence W. Shaw, assisted in great measure by Mrs. Teresa Roache who assembled the data for analysis and prepared the tables and figures. Valuable service was rendered by Mrs. J. D. Aronson, who worked with the field staff and assisted in the preparation of the material for analysis.

INDOLENT EARLY TUBERCULOSIS [1]

"Tuberculosis is said to be a disease without prognosis; and we are finding that this is no less true when the disease is diagnosed in its earliest stages than when it is overt. Nowadays its presence is being revealed 'accidently' by mass radiological surveys many months before any symptoms would have led to a clinical diagnosis, and quite a number of cases thus detected are showing a disappointing lack of response to all forms of treatment.

"A preclinically diagnosed patient will usually profess to feeling perfectly well, or—on maturer consideration, only slightly 'off colour,' for which other excellent excuses can be proffered. In addition to the ominous shadow, his erythrocyte-sedimentation rate is somewhat raised, and maybe his mean temperature also. So he is straightway put to bed, where in a few weeks he loses all traces of malaise, gains weight prodigiously, and feels fighting fit. His temperature and ESR return to normal limits and his x-ray appearances are little changed. But from time to time there is a small setback, sometimes unaccountable and sometimes occurring when after months of sameness the patient is allowed to do a little more for himself. He suffers a few hours' malaise, there is slight irregularity on his temperature chart, a slight rise in his ESR, and on his next film a fresh mottling in some zone hitherto translucent. It is noteworthy that at this stage excavation is rare, or at any rate can rarely be discerned radiologically. Sooner or later an artificial pneumothorax may be induced with encouraging immediate results, which however do not last, because a faint lesion appears in the opposite lung and causes another mild constitutional upset. Even with bilateral APs. the patient still seems to hang fire. Eventually in desperation he may be allowed to get up and start walking exercise. Paradoxically he improves in all respects for a few weeks, and then succumbs to another setback. This time it may be a small pool of fluid in one or other pleural space, which neither waxes nor wanes, and suggests a very indolent 'cold' pleurisy. This unsatisfactory lack of definite progress may persist for as long as two or three years, making all concerned with the case wish to Heaven it would Do Something. And then something does happen. A change of the patient's milieu will sometimes bring about a radical change in the tempo and quality of his disease reactions. In the old days a patient at this juncture might be transferred from Britain to the High Alps—or vice versa—and his new medical attendants would reap the kudos of having pulled him round the corner. More usually the change takes place mysteriously within the patient himself. Up to now he has been neither ill nor well, but increasingly disheartened. He now becomes really ill with full panoply of pyrexia, toxaemia, and abrupt loss of weight. On investigation he is found to have de-

[1] Editorial from The Lancet, 1: 821–822 (June 30, 1945) (London).

veloped some dramatic extension of his disease: perhaps excavation, perhaps a fulminating pleural effusion. Thereafter his clinical course is much more definite for better or for worse, and his response to treatment is more decisive. Moreover he is less disheartened.

"Investigation and comparison of experience in these indolent cases is called for. There are several lines of inquiry to be pursued. First, it will be generally agreed that this is not a new phenomenon. Reference to archives shows the occasional case in the past which was accidentally diagnosed in the preclinical stage and which failed to fulfill expectations of early resolution and dragged on and on. In the welter of more chronic cases these disappointing therapeutic failures were apt to slip from the memory. In this country war conditions do not seem to have appreciably altered the character of the disease, although the incidence of overt tuberculosis may be higher. These indolent early cases are obviously following much the same course they would be pursuing had they remained undetected. Some of them would never have come to light and would subsequently have shown calcified scars of old battles fought unsung. Others—and we have no means yet of knowing what proportion—would have proceeded to frank clinical disease. What then determines whether and when an indolent case will become 'energised'? In many so-called self-limiting diseases there is a rhythm in bodily response. Before the use of sulphonamides was customary, a case of lobar pneumonia could be relied on to become steadily worse until the crisis at the end of the week. Even now, when sulphonamides produce the expected clinical improvement within a few hours part of this rhythmical mechanism persists, for the ESR will still rise for the statutory seven days or so and will then commemorate a crisis on its own. If there is a comparable mechanism in pulmonary tuberculosis, the operative factor cannot be mere length of time but some quantitative measure of provocation; the phoney war drags on until a threshold is passed when the body tissues are provoked to rise and engage the invaders in major conflict. Thereafter it is the body-tissues which wage war. It is they that 'flare-up.' Looked at in this light, excavation appears to be a desperate attempt at scorched-earth policy, by which the invaders are ringed about with impervious granulation tissue and their habitat cut off from supplies. Bacilli are harmless in a cavity so long as the barriers hold. Cavities per se do not kill. One has only to survey the x-ray films of full-time workers at places like Preston Hall Colony to be reminded that health, happiness, and efficient citizenship are compatible with lungs resembling egg-crates. It is the unchecked Panzer-like infiltration of tissues that kills. A good brisk pleural effusion also often works wonders in rousing the bodily defences and proving the turning-point in laggard cases. When the pleurisy has resolved, the patient's progress is often much more decisive. This may be due partly to the purely mechanical restriction of the ipselateral

lung movement owing to the thickened pleura, but disease in the opposite lung will also improve and it is no rare finding that sputum manifestly coming from the opposite lung ceases to be TB-positive.

"Nevertheless the problem remains—Why is the bodily response in these early cases so indolent? Perhaps the answer lies elsewhere. It must not be forgotten that pulmonary tuberculosis appears to be one of the diseases (like rheumatism and peptic ulcer) which can be psychogenically determined. There exists, in fact, a striking resemblance between tuberculosis and the psychoneuroses. The onset in both often appears to follow hard on some severe emotional upset and the course seems to depend on the successful emotional reorientation of the patient. In both the prognosis is also influenced by any 'secondary gain' which the possession of a disabling illness may bring the patient; for the disease process of any patient who becomes well adjusted to invalidism is apt to run a chronic course and resist all attempts at unwelcome or untimely cure. Both tuberculosis and the psychoneuroses run protracted courses, and where the two conditions coexist in the same patient—as they often do—it is surely no flight of fancy to regard them as being the intimately linked outward expressions, in terms of bodily and mental illness, of a sickness at heart. The whole patient is sick in mind, body, and spirit. It is surely significant that in the early stages of both diseases the symptoms are overlooked or rationalised and ignored by the sufferer. He is 'off colour' but he will not admit it until some dramatic symptom—physical or mental—forces itself on his attention. During these early stages the trouble is present, the seeds of conflict are sown, an ordeal lies ahead, but the patient is not ready to fight the matter out. It is he that is indolent."

Excerpt From

REHABILITATING THE TUBERCULOUS

"Workers abroad who are specially interested in the practical application of rehabilitation measures—and all tuberculosis physicians should be—would do well to study intensively the techniques of rehabilitation before embarking on any grand ideal such as is implied in the Bill which is now law in Great Britain, for it is to be remembered that not only in the tuberculosis field but also in the realm of orthopaedics, blindness, deafness, and in other conditions there has been built up a vast experience of this subject over a period of many years in Great Britain, and this end, which has been achieved by the passage of the Disabled Persons Employment Bill, is merely the logical outcome of a vast amount of work which has been done mostly by voluntary organisations over a period of twenty-five years and more. In this coun-

[1] From Tuberculosis: A Symposium of Current Thought and Practice in Great Britain. United Nations Relief and Rehabilitation Administration, London. Pp. 29-30 (May 1945).

try we have learned some lessons which should be taken to heart by all. We know that progress is inevitably slow at first; that a start should be made at the bottom of the ladder and that the work should lead upwards and develop in the light of experience gained in the lower rungs. A key personnel has to be selected and used as a nucleus for the training of others. Schemes are better delayed until success is assured than to be launched with the possible risk of failure. The problem is, as I have said, essentially a clinical one and becomes even more so when the business direction and management is made easier by what amounts to Government intervention by supplying and guaranteeing markets for goods produced. No longer must we rely on diversional pursuits to amuse our patients. It is not for one moment suggested that amusement should not be provided or that recreational facilities should be denied to patients, but it is strongly advised that it is a waste of time and a thoroughly bad economic investment to have large numbers of patients spending valuable time, when the lesion in the chest is quiescent, in undertaking a variety of pastimes which are not related in any way to the major tasks in life which lie ahead. Facilities for workshops near towns are also envisaged in the Government scheme for rehabilitation as is also the opportunity for men and women who may be considered suitable to conduct small businesses on their own. Central direction is necessary and regionalisation is most desirable. Isolated independent schemes should be discouraged unless they are founded securely on the basic principles of successful experience and are prepared to co-operate in the national scheme as a whole * * *.

"We may say that rehabilitation in Great Britain during the war years has taken on a new lease of life. It is now being regarded as an integral part of treatment. There are many devices which may be adopted all with the same object in view—the restoration of the tuberculous patient to his normal working capacity, or to that degree of working capacity which is within the confines of the patient's physical limitations. Government assistance and subsidy and moral support are essential for the extension of any scheme on a national scale, and the economic repercussions on normal industry must be clearly recognised. Above all, the measures adopted in the rehabilitation of the tuberculous must be regarded in the light of clinical tests. That there will be failures as in all other medical and surgical procedures is without doubt, but there will also be a large proportion of brilliant successes. Our duty is to restore as many cases to normal working capacity as possible while they are still patients in the sanatorium, and for those who fail to reach the desired economic level it will be essential to provide sheltered industry in one form or another, whether this be in the sanatorium workshop, in the special centres near large towns (municipal workshops) or in the home. Such schemes for sheltered employment are for the open case in particular and they

fulfil the magnificent dual object of solving to some degree the economic plight of so many of our patients who are severely handicapped physically and of offering them that degree of voluntary segregation which is in itself a safeguard to the general population by reducing the total amount of massive infection in their midst.

"Successful rehabilitation does not show itself on a temperature and pulse chart. It is not capable of producing a radiographic image which can be compared with another, and it cannot in the nature of things be measured by a yardstick other than that of the well-being, contentment, happiness, and prolongation of life in our patients—a reward which more than compensates for the many difficulties which may lie in its successful application."

Excerpt From

CHEMOTHERAPY IN TUBERCULOSIS [1]

"In human tuberculosis the investigation of possible chemotherapeutic agents presents some peculiar difficulties. For example, in-vitro activity often bears little relationship to in-vivo activity; thus sulphathiazole was found by Ballon and Guernon to exert a pronounced inhibitory effect on the growth of human tubercle bacilli on solid media, but the same workers and others could demonstrate only a doubtful effect in tuberculous guinea pigs. Another difficulty is the difference between tuberculosis in laboratory animals and in man. Tuberculosis in the guinea pig is a relatively simple progressive disease with neither native nor acquired resistance apparently playing any part. Tuberculosis in man is often a most complex disease with a clinical and pathological picture very different from that in the guineapig. There may well be a fundamental difference in the permeability of the tubercle in man and in animals. Rich argues that the tubercle must be permeable to substances in solution, and quotes experimental evidence that foreign substances injected intravenously penetrate to the centre of the tubercle. Lewis and Menkin and Menkin, among others, used rabbits for this experimental work, but Tytler points out that in man the lesions are often largely necrotic and non-vascular compared with the relatively cellular and vascular lesions in animals. He suggests that it would be difficult for any chemical agent to penetrate and sterilise the necrotic lesions of man * * * .

"A substance * * * streptomycin, an antibiotic obtained from an actinomyces found in soil, was described by Schatz and Waksman as having a pronounced bacteriostatic and bactericidal action in vitro against a human strain of tubercle bacillus. With this substance Feldman and his colleagues have reported results in experi-

[1] From The Lancet, 1: 57-58 (Jan. 12, 1946). (London.)

mental tuberculosis in guinea pigs, which are strikingly better than any previously recorded with other drugs. The toxicity for guinea pigs is very low, so low that a cytotoxicity test showed approximately equal results with streptomycin and penicillin. Treatment of the infected guinea pigs was begun 48 days after infection and continued for 166 days. At the end of this time thirteen out of twenty-five treated guinea pigs showed no macroscopic or microscopic tuberculosis; in eight of these no tubercle bacilli were isolated either in culture or after inoculation. Sixteen out of twenty-four of the control untreated guinea pigs had died with extensive tuberculosis before the end of the experiment. A remarkable feature of the experiment was the result of tuberculin testing. Before treatment was started all the guinea pigs gave a positive reaction to tuberculin. When the experiment ended all the untreated controls still surviving remained tuberculin-positive, whereas nine of the treated animals had become tuberculin-negative. Feldman is rightly cautious about translating the experimental results into terms applicable to human tuberculosis. He again emphasises the difference between tuberculosis in man and in guinea pigs and deprecates any effort to predict what streptomycin may accomplish for human tuberculosis. 'Serious harm,' he says, may 'result to patients who refuse such proved remedies as sanatorium care and collapse therapy in the remote hope that a powerful chemotherapeutic remedy is imminent.'

"It is now clear that it is possible to exert a profound effect on experimental tuberculosis by chemotherapy. Whether the discovery of the effective chemotherapeutic agent for human tuberculosis comes soon or is long delayed, it is reasonable to believe that it will come. There may well be disappointments ahead—perhaps because of unexpected toxic effects arising from the long-continued administration of a potent drug in so chronic a disease as human tuberculosis. But considering the triumphs of the last few years it is hard to imagine that they will withstand an integrated attack by scientists and clinicians."

Excerpt From

TUBERCULOSIS IN SWEDEN AND THE FIGHT AGAINST IT IN RECENT YEARS [1]

"Since 1880 the tuberculosis mortality curve in Sweden has almost without interruption been on the decline, except for a sharp 'peak' during the First World War. During the Second World War a minor increase in tuberculosis mortality occurred in 1941 (from 0.71 to 0.74 0/00). In 1942 the curve again fell (to 0.68), in 1943 the mortality remained unchanged and in 1944 it declined to 0.65. Thus the

[1] Lundquist, John: Tubercle (London), 39-43 (March-April 1946).

crisis has caused a break in the fall of the mortality curve, but fortunately no major increase has set in. It is an interesting point that it was in the very year 1941 that the food supplies in Sweden were at their lowest, and a causal connexion between this fact and the rise in tuberculosis mortality seems not improbable.

"Despite the steady decline of the tuberculosis mortality in our country, tuberculosis still plays an important part as an endemic disease. It ranks as No. 4 amongst the causes of death, being surpassed only by cardiac and vascular diseases, tumours and senile diseases. In 1944 there were in Sweden nearly 4,250 deaths from tuberculosis. Whereas formerly most cases of death from tuberculosis were in young people, the trend has gradually shifted, so that the excessive mortality at the ages of 20–30 years has declined very considerably * * *. The mortality curve shows a decided tendency to shift toward the higher ages. The chief reason for this would appear to be that the period for primary infection now more frequently than before sets in at a higher age. Calmette vaccination in early youth may also have exercised some influence, though scarcely to any great extent, since prior to this period (1936–40) vaccination was carried out only on a somewhat limited scale. Formerly the towns of Sweden recorded a higher tuberculosis mortality than the country districts, but since about 1933 the mortality curve has been somewhat higher for the rural than for the urban population. In the major towns the tuberculosis mortality is far higher amongst men than amongst women, while the difference between the sexes is slight amongst the rural population. The reason for the excessive mortality in the case of males in the major towns is probably that men are exposed to greater risk of infection as a consequence of industrialization * * *.

FLUOROGRAPHY

"Miniature-radiographic investigations are being carried out on an ever-increasing scale. At the central dispensaries, side by side with the dispensary work proper, mass examinations are being undertaken on a large scale of different groups of the population, such as industrial workers, children, etc., with miniature radiography. These examinations are partly financed by contributions from the National Anti-Tuberculosis Society. Since 1940 all conscripts in the Services have been subjected to miniature-radiographic tests, and since 1942 the National Anti-Tuberculosis Society has itself organized extensive miniature-radiographic tests in various parts of the country, partly with a lorry specially built for the purpose and partly with transportable apparatus assembled at the place of work. Moreover, in certain parts of the country where the tuberculosis incidence is particularly high, an examination of the entire population has been carried out by the National Society, and it has there proved possible, thanks to

assistance from the local authorities, health organizations, etc., to obtain practically 100 percent cooperation along voluntary lines. According to the experience gained so far, on an average 1 to 2 percent of the cases of tuberculosis are detected by these mass examinations Among the adult population about 3 persons per 1,000 inhabitants are found to be in need of medical care at a sanatorium. Generally, the fresh cases of tuberculosis discovered through district-examination have largely belonged to the higher-age groups. Thus, it was found that of the fresh cases discovered in Gotland, where 99 percent of the population were examined, both absolutely and relatively the majority of the cases previously unknown to the dispensaries belonged to the ages over 60. Similar findings have been noted elsewhere in the country, and this implies that the dispensaries have to pay special attention to elderly persons.

FLUOROGRAPHY FOR ALL

"So far about 750,000 persons, excluding those in the defence forces, have been examined in this way. The Medical Council has recently submitted proposals for a general miniature-radiographic examination of the entire population of the country. According to this scheme, the nation-wide examination would not be obligatory, and one-third of the country would be examined annually, either by the aid of fixed apparatus at the central dispensaries or else by ambulatory patrols under the supervision of specially trained doctors. For about a year a special form of miniature-radiographic examination has been practised by the National Anti-Tuberculosis Society at its miniature-radiographic bureau in Stockholm. This bureau is primarily intended for those seeking jobs at labour exchanges and for domestic servants employed in private homes, children's nurses, etc. By this means it is hoped, to some extent at least, to be able to reach the young women at the age that is particularly exposed to tuberculosis. Moreover, with the financial aid of the Society similar examinations of these groups are carried on at the central dispensaries for a very small charge * * *.

BCG

"Calmette vaccination has been carried on in Sweden on an ever-increasing scale since about the year 1937, when Wallgren largely took the initiative in practising vaccination. At the dispensaries vaccination is performed amongst the dependents of tuberculous patients (in 1944 over 84,000 Calmette vaccinations were performed at the dispensaries alone). All conscripts are offered Calmette vaccination, and in recent years the children in most schools have been vaccinated in the leaving classes and in the beginners' classes. The *per os* method formerly practised in north Sweden has been abandoned

and replaced by the subcutaneous method. In certain areas experiments have been made with Rosenthal's cutaneous vaccination. In some of the larger towns all those reacting negatively to tuberculin tests have also been subjected to Calmette vaccination in conjunction with the miniature-radiographic examination. According to a law passed in 1944 the tuberculin test is obligatory for the pupils at certain schools, and those showing a negative reaction are advised to undergo Calmette vaccinations * * *."

NEW FILMS AVAILABLE ON ADMINISTRATION OF MASS RADIOGRAPHY PROGRAMS

Two motion pictures on miniature film photofluorography and tuberculosis case-finding methods have just been completed by the United States Public Health Service, under the supervision of the Tuberculosis Control Division. These are teaching and orientation films intended for an audience of professional, technical, or administrative personnel in the field of medicine, public health, and hospital care.

The film, "Routine Admission Chest X-Ray in General Hospitals," shows the step-by-step sequence of routine miniature film chest X-ray service for all patients admitted to the hospital or clinic. Animated drawings illustrate the operation of the phototimer, present case-finding statistics, and demonstrate the physical arrangement of the admission chest X-ray unit. The dangers of undiagnosed tuberculosis in patient and personnel groups. and the practicability and advantages of routine admission chest x-ray examination in the general hospital are emphasized.

The film, "Techniques of Group Chest X-ray Services," provides community health leaders and public health personnel with a detailed procedure outline for administration and operation of mass radiography programs in tuberculosis case finding. The film illustrates the functions and responsibilities of official and voluntary health agencies, professional groups, labor, and management, before, during, and following a typical mass radiography project.

The second half of this film depicts an actual mass radiography project in operation—from the time it is first scheduled until it has been completed and the films read and reports tabulated. The photography and narration highlight all the details that must be carefully considered by the responsible administative group and by operating personnel.

The films are one reel each, 16 mm. in size, black and white, with sound. Prints are available for short-term loan from Tuberculosis Control Consultants stationed in the District Offices of the

United States Public Health Service. Health agencies that desire to purchase prints should order by title from Castle Films, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

LARYNGEAL SWABS FOR DETECTION OF TUBERCULOSIS [1]

"In a considerable proportion of cases of pulmonary tuberculosis, there is no spontaneous expectoration, especially in female patients, and patients under collapse treatment. A simple and efficient method is described to obtain suitable material for bacteriological examination in these cases. A laryngeal swab, made up from a piece of wire with cotton-wool wrapped round its end, is passed down the larynx and the patient asked to cough. Two swabs are taken from each patient. The swabs are passed through sterile test tubes containing 10% sulphuric acid and 2% sodium hydroxide solutions, for five minutes in each, and then 2 petragnani media are inoculated with each swab. The cultures are examined after five days for contamination and after 28 days for macroscopical colonies of tubercle bacilli. The results obtained in two groups of cases of 166 and 107 patients were: 37.95% and 54.20% positive cultures respectively. The highest positive figures were obtained in female patients. Thus tubercle bacilli were demonstrated in a considerable proportion of cases previously regarded as sputum-negative or having no sputum. Apart from diagnosis, the method gives valuable help in judging the efficiency of treatment. The findings of bacilli in early infiltrative lesions is of considerable practical as well as theoretical importance."

[1] Nassau, E.: The culture of tubercle bacilli from laryngeal swabs. Proceedings of the Royal Society of Medicine (London), 34: 397–400 (May 1941).

INCIDENCE OF HOSPITALIZATION, APRIL 1946

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover hospital service plans scattered throughout the country mostly in large cities.

Item	April 1945	April 1946
1. Number of plans supplying data	80	80
2. Number of persons eligible for hospital care	16,954,625	20,877,914
3. Number of persons admitted for hospital care	149,184	191,170
4. Incidence per 1,000 persons, annual rate during current month (daily rate × 365)	107.1	111.4
5. Incidence per 1,000 persons, annual rate for the 12 months ended April 30, 1946	103.7	108.1
6. Number of plans reporting on hospital days	21	29
7. Days of hospital care per case discharged during month [1]	7.89	8.81

[1] Days include entire stay of patient in hospital whether at full pay or at a discount.

DEATHS DURING WEEK ENDED MAY 11, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 11, 1946	Corresponding week, 1945
Data for 92 large cities of the United States:		
Total deaths	9,053	9,050
Average for 3 prior years	9,141	
Total deaths, first 19 weeks of year	185,179	179,070
Deaths under 1 year of age	614	567
Average for 3 prior years	601	
Deaths under 1 year of age, first 19 weeks of year	11,447	11,799
Data from industrial insurance companies:		
Policies in force	67,197,338	67,296,785
Number of death claims	12,357	12,024
Death claims per 1,000 policies in force, annual rate	9.6	9.3
Death claims per 1,000 policies, first 19 weeks of year, annual rate	10.8	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 18, 1946

Summary

Of 11 cases of smallpox reported, 2 occurred in the State of Washington, 7 in Indiana, and 2 in Illinois. The cumulative total to date is 204, the same as for the corresponding period last year. The 5-year median is 437 (see page 843).

A total of 84 cases of poliomyelitis was reported for the week, as compared with 56 last week, 47 for the corresponding week last year, and a 5-year (1941–45) median of 36. Of the current total, more than reported for any corresponding week of record (since 1927), States reporting more than 5 cases each are as follows (last week's figures in parentheses): Florida 18 (17), Colorado and California 11 each (2 each), Texas 10 (16). The total for the year to date is 813, as compared with 696 for the corresponding period last year, and a 5-year median of 460. States reporting 12 or more cases since March 16 (last year's figures in parentheses) are as follows: New York 35 (50), Florida 67 (17), Louisiana 12 (5), Texas 45 (62), Colorado 22 (1), Washington 12 (4), California 43 (16).

The incidence of measles declined during the week in all of the 9 geographic sections except for a slight increase in the North Central areas. The total for the week, 32,317, as compared with 35,208 last week and a 5-year median of 22,881, is more than reported for a corresponding week since 1941. The total to date, 486,655, as compared with a 5-year median of 396,365, was exceeded in the corresponding periods of both 1941 and 1944.

Of the total of 259 cases of diphtheria for the week, New York and Texas reported 25 each, Kansas 22, and Maryland 14. The current total, while more than that for a corresponding week since 1939, is less than reported for any previous week this year except for each of the 2 immediately preceding weeks. The cumulative total, 6,929, as compared with a 5-year median of 5,439, is more than recorded for the corresponding period of any year since 1939.

A total of 8,901 deaths was recorded for the week in 93 large cities of the United States, as compared with 9,144 last week, 9,202 and 8,906, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 9,047. The total for the year to date is 196,267, as compared with 190,001 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended May 18, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945	
NEW ENGLAND												
Maine	2	0	0	2	------	------	318	3	69	0	0	0
New Hampshire	0	0	0	------	------	------	43	------	40	0	1	1
Vermont	0	0	0	------	------	------	83	9	66	0	1	0
Massachusetts	5	2	2	------	------	------	2,338	190	1,053	1	3	7
Rhode Island	0	0	0	------	26	------	64	12	39	0	1	1
Connecticut	3	1	0	2	2	1	411	144	467	1	2	2
MIDDLE ATLANTIC												
New York	25	13	15	[1] 4	[1] 1	[1] 4	4,125	112	1,316	12	26	26
New Jersey	12	1	2	5	5	5	3,893	66	1,261	0	11	10
Pennsylvania	12	7	10	1	3	1	2,573	445	1,591	11	8	8
E. NORTH CENTRAL												
Ohio	10	2	5	7	4	11	727	96	469	3	13	13
Indiana	2	1	3	16	6	6	483	46	103	3	2	2
Illinois	8	11	17	4	2	6	868	275	536	7	14	14
Michigan [2]	7	6	5	2	3	2	1,407	339	661	8	6	6
Wisconsin	3	3	1	25	46	31	2,812	53	2,021	2	4	4
W. NORTH CENTRAL												
Minnesota	5	3	3	------	2	1	66	4	388	2	2	2
Iowa	1	0	3	------	------	2	352	56	185	1	2	2
Missouri	3	4	3	5	1	1	188	36	247	5	2	2
North Dakota	1	3	2	------	1	------	10	3	67	0	0	0
South Dakota	7	1	1	------	------	------	29	35	21	0	0	0
Nebraska	4	3	1	5	9	2	280	56	195	1	0	0
Kansas	22	9	2	1	------	2	344	44	378	0	2	2
SOUTH ATLANTIC												
Delaware	1	1	0	------	------	------	23	1	46	0	1	0
Maryland [2]	14	13	8	------	1	2	683	51	369	1	6	7
District of Columbia	0	2	0	------	------	1	332	11	119	1	0	2
Virginia	10	5	4	100	103	103	779	45	376	4	1	6
West Virginia	1	0	4	------	6	4	100	43	97	1	1	1
North Carolina	10	10	8	------	------	4	542	103	402	0	2	2
South Carolina	5	6	5	157	168	188	264	29	213	0	2	2
Georgia	3	2	3	3	6	8	234	6	90	3	1	1
Florida	7	4	3	3	1	3	183	8	93	2	5	5
E. SOUTH CENTRAL												
Kentucky	0	0	2	------	1	2	71	24	119	3	3	3
Tennessee	2	3	2	17	7	15	191	79	150	1	6	6
Alabama	3	5	1	14	20	49	154	20	114	0	8	7
Mississippi [2]	3	3	3	------	------	------	------	------	------	0	0	4
W. SOUTH CENTRAL												
Arkansas	3	0	2	14	25	17	189	28	112	1	3	0
Louisiana	7	3	4	6	14	4	100	25	52	1	2	2
Oklahoma	6	1	2	22	11	22	223	24	74	3	1	0
Texas	25	32	22	415	546	442	1,577	422	733	6	6	6
MOUNTAIN												
Montana	0	0	0	1	2	2	182	8	113	0	0	0
Idaho	0	0	0	6	1	------	83	2	12	0	0	0
Wyoming	4	0	0	------	------	1	77	7	51	1	0	0
Colorado	2	8	6	6	4	14	897	16	315	0	1	1
New Mexico	1	4	1	6	------	------	65	10	41	0	0	0
Arizona	3	0	0	43	54	61	120	23	116	0	0	0
Utah [2]	0	0	0	1	3	6	353	253	98	0	0	0
Nevada	0	0	0	------	------	------	4	5	5	0	0	0
PACIFIC												
Washington	7	4	2	------	------	2	490	212	342	3	5	5
Oregon	1	3	2	3	11	11	322	94	115	0	2	2
California	9	22	18	13	5	53	2,665	1,451	1,451	5	19	19
Total	259	201	194	909	1,100	1,124	32,317	5,024	22,881	93	175	175
20 weeks	6,929	5,537	5,439	184,505	61,524	74,496	486,655	64,170	396,365	3,379	4,522	4,522

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended May 18, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945		May 18, 1946	May 19, 1945	
NEW ENGLAND												
Maine	0	0	0	32	44	16	0	0	0	0	0	0
New Hampshire	0	0	0	0	6	6	0	0	0	0	0	0
Vermont	1	0	0	5	8	11	0	0	0	0	0	0
Massachusetts	1	0	0	235	357	357	0	0	0	0	1	2
Rhode Island	0	0	0	10	17	19	0	0	0	0	0	0
Connecticut	0	0	0	69	56	56	0	0	0	0	1	0
MIDDLE ATLANTIC												
New York	4	6	1	572	567	488	0	0	0	3	4	5
New Jersey	0	0	1	165	146	146	0	0	0	4	2	2
Pennsylvania	1	0	0	336	607	388	0	0	0	4	8	4
EAST NORTH CENTRAL												
Ohio	1	4	1	357	364	231	0	0	0	6	3	4
Indiana	0	0	0	46	75	75	7	1	1	1	0	1
Illinois	3	0	1	182	258	258	2	0	1	1	2	2
Michigan [2]	0	0	0	230	256	255	0	0	0	2	3	3
Wisconsin	0	0	0	100	203	203	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	1	0	0	48	95	69	0	0	0	0	0	0
Iowa	0	0	0	55	44	41	0	0	0	0	0	0
Missouri	1	0	0	53	68	68	0	0	0	1	2	0
North Dakota	0	0	0	11	34	6	0	1	0	3	1	0
South Dakota	0	0	0	6	24	22	0	0	0	0	0	0
Nebraska	0	0	0	24	95	20	0	0	0	0	0	0
Kansas	1	0	0	53	51	47	0	0	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	8	8	8	0	0	0	1	1	0
Maryland [2]	2	1	0	200	155	100	0	0	0	1	2	1
District of Columbia	0	0	0	14	34	12	0	0	0	0	0	0
Virginia	1	0	1	63	66	32	0	0	0	2	1	4
West Virginia	0	1	0	23	56	38	0	0	0	0	1	2
North Carolina	3	0	0	31	65	21	0	0	0	0	2	2
South Carolina	0	4	3	6	14	8	0	0	0	5	2	2
Georgia	2	0	0	11	31	16	0	0	0	3	1	5
Florida	18	0	0	6	8	3	0	0	0	0	1	4
EAST SOUTH CENTRAL												
Kentucky	1	1	1	12	52	52	0	0	0	1	6	6
Tennessee	0	0	0	18	46	43	0	1	0	1	4	4
Alabama	0	2	0	19	19	10	0	0	0	0	1	2
Mississippi [2]	1	0	1	5	18	6	0	0	0	1	0	1
WEST SOUTH CENTRAL												
Arkansas	0	0	0	4	8	3	0	1	1	5	1	1
Louisiana	5	1	1	5	7	7	0	0	0	7	1	6
Oklahoma	0	2	0	9	13	13	0	1	0	5	0	2
Texas	10	24	4	46	70	33	0	0	0	4	8	10
MOUNTAIN												
Montana	0	0	0	20	31	15	0	0	0	0	3	0
Idaho	0	0	0	10	13	13	0	0	0	2	1	0
Wyoming	0	0	0	11	7	11	0	0	0	0	0	0
Colorado	11	0	0	45	56	56	0	0	0	1	0	0
New Mexico	2	0	0	14	20	4	0	1	0	1	0	1
Arizona	0	0	1	16	36	8	0	0	0	1	2	1
Utah [2]	0	0	0	20	15	15	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	3	1	1	25	65	30	2	0	0	1	1	1
Oregon	0	0	0	43	17	17	0	0	1	2	1	0
California	11	0	2	148	349	140	0	0	0	4	3	3
Total	84	47	36	3,421	4,654	3,686	11	6	16	73	70	93
20 weeks	813	696	460	69,924	108,150	79,410	204	204	437	1,029	1,184	1,490

[2] Period ended earlier than Saturday.
[4] Including paratyphoid fever reported separately, as follows: New Jersey 2; Ohio 1; Missouri 1; Virginia 2; South Carolina 1; Georgia 1; Louisiana 3; Colorado 1; Arizona 1; Oregon 2.

Telegraphic morbidity reports from State health officers for the week ended May 18, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— May 18, 1946	Whooping cough: Week ended— May 19, 1945	Whooping cough: Median 1941–45	Week ended May 18, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	27	55	23								3
New Hampshire	6	4	1								
Vermont	13	35	23								2
Massachusetts	147	162	162		1						2
Rhode Island	21	11	29								
Connecticut	35	56	74								1
MIDDLE ATLANTIC											
New York	155	213	257	1	4					1	5
New Jersey	171	136	136	2		2					1
Pennsylvania	110	186	213				1				1
EAST NORTH CENTRAL											
Ohio	81	144	167				1				4
Indiana	25	13	30	1			1		2		5
Illinois	107	40	100	5							13
Michigan [3]	158	71	233	3	2						3
Wisconsin	90	27	125								2
WEST NORTH CENTRAL											
Minnesota	13	7	41	4							5
Iowa	32	7	20								9
Missouri	12	36	21							1	1
North Dakota		1	4								
South Dakota			2								3
Nebraska	7	1	6								1
Kansas	24	14	46	1							15
SOUTH ATLANTIC											
Delaware	2	3	3					1			
Maryland [3]	12	59	65			3	1	2			3
District of Columbia	18	8	9								
Virginia	51	63	96			54		2			1
West Virginia	40	7	12					1			
North Carolina	100	155	155					2		1	
South Carolina	49	108	108		15				2	1	
Georgia	6	7	23		4				1	9	2
Florida	23	6	13	1						10	1
EAST SOUTH CENTRAL											
Kentucky	14	38	62						1		
Tennessee	22	20	33	1				2	1	1	2
Alabama	12	32	51				1		2	6	2
Mississippi [3]									4	4	3
WEST SOUTH CENTRAL											
Arkansas	1	8	22						2		2
Louisiana	12	10	10	2			1		1	1	
Oklahoma	11	19	19	3							
Texas	182	247	288	24	580	41	1			17	15
MOUNTAIN											
Montana	8	2	13	1							
Idaho	22	4	4			2					1
Wyoming		3	3	3				1			
Colorado	32	34	34								
New Mexico	21	3	16								
Arizona	9	28	18			16					
Utah [3]	16	53	67					1	1		2
Nevada											
PACIFIC											
Washington	35	20	25					2			1
Oregon	24	21	21	2							
California	75	373	373	5	1		3				11
Total	2,026	2,550	3,767	59	607	118	10	14	17	52	131
Same week, 1945	2,550			32	382	96	4	10	15	70	118
Average, 1943–45	2,881			31	394	113	6	[4] 10	18	[4] 52	
20 weeks: 1946	37,026			763	6,254	2,107	166	56	356	909	1,684
1945	49,852			595	8,504	2,287	133	42	317	1,002	1,760
Average, 1943–45	55,648		[4] 76,786	567	5,830	1,569	189	[4] 63	291	[4] 878	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

Anthrax: Texas 1 case.

NOTIFIABLE DISEASES, FIRST QUARTER, 1946

The figures in the following table are the totals of the monthly morbidity reports received from the State health authorities for January, February, and March 1946. These reports are preliminary and the figures are therefore more or less incomplete and subject to correction by final reports. In most instances they include cases reported in both civilian and military populations. The comparisons made are with similar preliminary reports; but owing to population shifts and the presence of large military populations in certain States, the figures for some States are not comparable with those for prior years, especially for certain diseases. Each State health officer has been requested to include in the monthly report for his State all diseases that are required by law or regulation to be reported in the State, although some do not do so. The lists of diseases required to be reported are not the same for each State. Only 11 of the common communicable diseases are notifiable in all the States. In some instances cases are reported, in some States, of diseases that are not required by law or regulation to be reported and the figures are included although manifestly incomplete. There are also variations among the States in the degree of, and checks on, the completeness of reporting of cases of the notifiable diseases. As compared with the deaths, incomplete case reports are obvious for such diseases as malaria, pellagra, pneumonia, and tuberculosis while in many States other diseases, such as puerperal septicemia, rheumatic fever, and Vincent's infection, are not reportable.

In spite of these known deficiencies, however, these monthly reports, which are published quarterly and annually in consolidated form, have proved of value in presenting early information regarding the reported incidence of a large group of diseases and in indicating trends by providing a comparison with similar preliminary figures for prior years. The table gives a general picture of the geographic prevalence of certain diseases, as the States are arranged by geographic areas.

Leaders are used in the table to indicate that no case of the disease was reported.

Consolidated monthly State morbidity reports for January, February, and March 1946

Division and State	Anthrax	Chickenpox	Conjunctivitis [1]	Diphtheria*	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, infectious	German measles	Hookworm disease	Influenza	Malaria [2]	Measles*	Meningitis, meningococcus*	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENGLAND																		
Maine	------	666	------	32	1	------	------	------	351	------	122	28	247	13	1,116	------	------	288
New Hampshire	------	184	------	2	------	------	------	------	72	------	60	------	254	8	210	------	------	55
Vermont	------	745	------	10	------	------	------	------	229	------	311	------	73	2	821	------	------	88
Massachusetts	------	3,178	32	51	2	27	------	3	969	------	------	216	5,245	58	2,168	18	------	[3] 792
Rhode Island	------	201	------	8	------	1	------	------	6	------	28	[4] 69	48	17	249	------	------	126
Connecticut	------	1,866	22	31	8	7	------	------	934	3	779	245	1,117	32	3,695	------	------	1,319
MIDDLE ATLANTIC																		
New York	2	6,458	------	206	44	62	------	12	------	------	[5] 259	889	29,045	245	[6] 1,703	10	------	6,821
New Jersey	1	5,258	------	49	8	1	13	3	3,661	------	289	403	13,728	71	2,449	6	------	1,745
Pennsylvania	4	5,162	------	235	------	------	------	8	------	------	101	------	14,687	185	4,112	4	------	1,233
EAST NORTH CENTRAL																		
Ohio	------	3,398	------	395	3	6	------	1	582	------	389	236	2,749	119	1,520	92	1	1,005
Indiana	------	1,101	3	191	11	2	3	4	75	------	733	132	5,766	39	348	------	------	140
Illinois	------	2,768	------	201	22	12	------	10	690	------	218	212	15,306	186	2,372	128	------	2,714
Michigan	------	4,474	51	160	10	39	------	2	875	------	89	197	23,829	76	4,107	6	------	851
Wisconsin	------	5,631	------	26	3	------	------	2	1,584	------	2,061	29	8,060	38	6,077	4	------	[3] 317

WEST NORTH CENTRAL																		
Minnesota		725	1	235	[6] 21	2	2	1		[7] 2	39	315	358	51				85
Iowa		405		53	3			1	90		59	142	1,083	36	498			71
Missouri		319	1	84			3		139		161	77	4,230	72	426			462
North Dakota		120		37			4	2			248	1	66	11				249
South Dakota		156		14							164	13	669	6	231			19
Nebraska	2	482		30				1			1,042	59	1,280	7	172			67
Kansas		1,268	109	90	3		1	4	182		2,569	19	8,812	18	1,394			245
SOUTH ATLANTIC																		
Delaware		138		7								7	195	9	36			4
Maryland		1,301	3	192	4	9	1	3	443		155	27	2,699	49	250	5	1	651
District of Columbia [8]		201		1		1					34	[8] 13	1,172	21	127		1	308
Virginia		898		141	3		408				17,884	116	4,383	90	529		9	1,207
West Virginia		295		53	[9] 42	[9] 1					4,310	44	694	48	266			104
North Carolina				187	10	3		3				116	2,865	70				
South Carolina		603		73	23	180			229	283	16,382	1,086	2,751	17	423	11	220	2,078
Georgia		276	5	68	8	15	27			1,119	1,646	180	1,818	17	195		8	346
Florida		394	1	81	30	1		6	98	698	443	114	939	35	441	1	1	166
EAST SOUTH CENTRAL																		
Kentucky		435		107	1	10		7	67	4	3,144	184	5,224	67	303		3	498
Tennessee		346	1	116		3	2	7	207	6	2,334	160	2,211	75	105	2	14	1,005
Alabama		392		82	6			5	709		10,368	316	1,369	55	510		9	1,661
Mississippi		2,687		104	346	1,592				1,085	41,291	2,360	9,752	56	1,583	10	455	7,647
WEST SOUTH CENTRAL																		
Arkansas		511		119	47	16		3	562		5,303	242	1,244	53	667	1	4	754
Louisiana		207		104	35	3			114	127	19,642	94	1,591	61	149	7	1	821
Oklahoma		215		76	7	4	1				5,751	92	1,310	24	135		4	519
Texas		5,228		569	130	3,345	497	3			55,084	1,675	9,891	125	3,742	23	222	5,095
MOUNTAIN																		
Montana		527	29	29	2				317		789	6	230	5	780			118
Idaho	1	290	14	21	1			2	281		1,489	20	994	2	107			144
Wyoming		162	8	14					23		18	5	357	4	69			51
Colorado		1,167		74	3	8			280		1,296	37	3,146	12	623			567
New Mexico		113	5	19	1	5	10	1	21		46	31	150	9	600			238
Arizona		535		54	1		269	2	104		3,235	106	529	4	583	2	2	568
Utah		1,203			1				263		7,752	28	4,008	8	744			145
Nevada		33	18	1							48	2	875	1	79			34
PACIFIC																		
Washington		1,508	73	91	1	1	29	7	268		200	8	6,826	44	2,068			300
Oregon		474		65	3		1				459	28	2,085	25	520			306
California		9,604	12	407	43	62		10	5,250		4,926	608	23,457	236	7,550			[8] 968
Total	10	74,308	388	4,995	887	5,418	1,271	113	19,675	3,327	213,750	10,978	229,417	2,512	56,852	330	955	44,995
First quarter 1945	14	133,938	599	3,981	667	7,907	1,591	94	11,076	5,230	74,254	10,996	37,584	3,231	76,829	489	854	40,814
Median, 1941-45	18	128,054		3,917	591	3,929	1,094	142	42,543	5,230	86,624	5,016	222,463	3,231	76,829	387	907	57,938
Alaska		61		13					6		386		186		3			25
Hawaii Territory		224	1	5	6	14			392	1	11,652	[10] 43	314	5	84			[3] 33
Panama Canal Zone [11]		20		63	14	10						210	22	9	14			[12] 119

See footnotes at end of table.

Consolidated monthly State morbidity reports for January, February, and March 1946—Continued

Division and State	Poliomyelitis*	Rabies in man	Rheumatic fever	Rocky Mountain spotted fever	Scarlet fever*	Septic sore throat	Smallpox*	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms*	Tuberculosis, respiratory	Tularemia	Typhoid and paratyphoid fever*	Paratyphoid fever	Typhus fever, endemic	Undulant fever*	Vincent's infection	Whooping cough*
NEW ENGLAND																			
Maine					485	3				1	120	112		4	1		6	2	298
New Hampshire	1				331	46					38			1				18	94
Vermont	4				125	1					57			2	2		13	13	280
Massachusetts	3				2,411	38		1	1	11	809	769		25	21		6		1,485
Rhode Island	1		23		147	4				1	115	111		2	2		2		525
Connecticut	1				630	80		1		9	296	285		9	7		26		750
MIDDLE ATLANTIC																			
New York	33				[14] 6,562					14	3,223	3,053	5	16	2	1	49		2,725
New Jersey	6				1,436	59	1	4		1	1,073			16	3		8		1,804
Pennsylvania	14	1	160		4,282			2			907			27	2	1	25		1,646
EAST NORTH CENTRAL																			
Ohio	17	1	27		4,285	15	5	1	2	4	1,288		7	19	1		23	15	1,036
Indiana	6		1		1,174	67	9			1	654	621	10	10	1		13	12	272
Illinois	8		67	1	2,509	46	1	7	9	2	1,510	1,363	18	34	1		78	50	1,038
Michigan	8		115		1,838	90					1,147		1	16	5	1	21		1,401
Wisconsin	3				1,718	43					465		3	3			54		825
WEST NORTH CENTRAL																			
Minnesota	1		28		710	263		1			[6] 366		2	6			91	27	105
Iowa	9		5		692	35	5				164			4			[14] 60	4	110
Missouri	7		30		840	7	1				485		5	12			5		97
North Dakota			6		136	3			41		43	[15] 24		1			1	49	3
South Dakota					205	1			64		48	32		1			17		7
Nebraska	1				579		1				116			2			1		43
Kansas	5				1,034	5	4	2	6		194	191	4	2			49	34	316
SOUTH ATLANTIC																			
Delaware					84						47	47		2					49
Maryland	2		26		1,107	30		3			669	639		6	1		9	11	255
District of Columbia	1				258						506	488		9		1			72
Virginia	6				1,106	333		1	1		613	[16] 302	23	17		2	10		507
West Virginia	3				486	11					416			4			1		239
North Carolina	9				608	17	2				701	690	17	16	4	12	1		722
South Carolina	3		184		141			3			125		1	13	3	25	7		750
Georgia	8		2		149	107	2	2			335	333	26	35	17	93	43	18	169
Florida	53				102	12		5			320	317		11	4	67	15	24	131

EAST SOUTH CENTRAL																			
Kentucky	4			1	518	4			13		580	577	9	8			5	4	268
Tennessee	9		2		519	55	1	5			934		32	18	3	13	10	51	259
Alabama	5				271		4	8			760		6	11		77	23		206
Mississippi	16				223		7		19		353	349	25	15		29	10		1,432
WEST SOUTH CENTRAL																			
Arkansas	12				157	105	5		103		321	302	10	11	1	6	6		98
Louisiana	19		50		149	134	3	7			692	678	23	30	3	43	7		34
Oklahoma	7				296	53	7		100		670			7		2	6	2	98
Texas	31			1	1,043	152	19		54		1,178		12	69	8	213	178		1,789
MOUNTAIN																			
Montana	[17] 19		3		123	20	[18] 1	1	35		94	35	7	1			2	3	32
Idaho			22		100	58	8				58			4			2	11	131
Wyoming	1		1	1	117	4			2		10			1			1	1	11
Colorado	2		95		487	153	5				165			8	2		5	10	346
New Mexico	6				194	3			1		[6] 813	[6] 792		5			1		111
Arizona	3		2		176	2			66	1	290			10			14		186
Utah	6		23		420	1					52	46	1	1	1		6		246
Nevada					58	13			2		57							6	23
PACIFIC																			
Washington	33		97		492	49	31				544			5	1		11	143	562
Oregon	3		3	1	316	30					165	163		4	1		6		135
California	102		271	1	3,070		8	12	7	1	2,320	2,205	3	43	11	14	73		1,419
Total	[17] 491	2	1,243	6	44,899	2,152	130	66	526	49	27,536	14,524	250	576	108	600	1,000	508	25,146
First quarter 1945	416	3	831	5	74,781	3,173	136	68	502	169	[19] 29,310	[19] 17,123	242	723	108	649	1,111	554	34,023
Median 1941–45	305	7		5	51,491	2,513	299	59	763	130	27,061	15,065	237	924		558	624	499	52,715
Alaska					2	21					158	134							
Hawaii Territory	8				14	12	[18] 1	3			228	218		4	2	16			1
Panama Canal Zone [11]											[12] 14	[12] 10		9	6	2			[12] 9

See footnotes on p. 840.

FOOTNOTES FOR TABLE ON PAGES 836 TO 839

*Diseases marked with an asterisk (*) are reportable by law or regulation in all the States, including the District of Columbia. Typhoid fever is reportable in all the States, paratyphoid fever in all except 6 States. Syphilis is reportable in all the States and the District of Columbia but is not included in the table. Chickenpox, conjunctivitis, influenza, and pellagra were dropped from the list of reportable diseases in North Carolina in 1945. Rheumatic fever has been made reportable in Louisiana.

1 Includes cases of kerato- and suppurative conjunctivitis and of pink eye
2 In some States practically all in the military.
3 Lobar pneumonia only.
4 Includes 1 case contracted by blood transfusion.
5 New York City only.
6 Includes nonresidents.
7 Nonresidents.
8 The total number of cases of malaria reported in the District of Columbia for the year 1945 should be 89 instead of 144 as published on page 423 of the PUBLIC HEALTH REPORTS of Mar. 22, 1946.
9 Includes cases in Ashford General Hospital.
10 Off-shipping.
11 Includes the cities of Colon and Panama.
12 In the Canal Zone only.
13 Includes septic sore throat.
14 Includes delayed reports.
15 For February and March only.
16 For January and February only.
17 Includes 2 cases delayed reports for 1945.
18 Occurred on board a trooptrain.
19 Corrected figures.

The following list includes certain rare conditions, diseases of restricted geographical distribution, and those reportable in or reported by only a few States; last year's figures in parentheses (where no figures are given no cases were reported last year):

Actinomycosis: Connecticut 1 (1), Illinois 3, Minnesota 4 (3), Iowa 2 (1), South Dakota 1.
Coccidioidomycosis: New Mexico 1, Arizona 6, California 14 (10).
Dengue: South Carolina 2 (4), Georgia 1, Texas 3, Oregon 1.
Diarrhea: Pennsylvania 3 (diarrhea and enteritis), Ohio 63 (diarrhea and enteritis), Illinois 8 (1), Maryland 26 (7), South Carolina 2,300 (1,971). Florida 6 (12), Colorado 3 (1) (diarrhea and enteritis), New Mexico 43 (52) (diarrhea and enteritis), Utah 1 (15), Washington 56 (diarrhea and enteritis), California 18.
Dog bite: Illinois 2,140 (1,873) (all animals), Michigan 1,232 (1,387), Arkansas 206 (88).
Food poisoning: Indiana 6, Illinois 3 (1), Louisiana 1 (5), Idaho 1, Nevada 1, California 104 (65).
Glanders: Tennessee 1.
Granuloma, unspecified: Ohio 14 (13).
Granuloma inguinale: Missouri 8 (1), Florida 43 (18), Tennessee 17 (15), Mississippi 204 (143), Louisiana 93 (48), Arizona 1.
Impetigo contagiosa: Ohio 5, Indiana 26 (5), Illinois 10 (22), Michigan 23 (262), Missouri 3, North Dakota 8 (1), Kansas 4 (21), Maryland 0 (2), Kentucky 1, Montana 2 (21), Idaho 16, Wyoming 3 (22), Colorado 24 (39), Nevada 44 (7), Washington 258 (250), Hawaii Territory 5 (27).
Jaundice (including hepatitis and Weil's disease): Ohio 4, Indiana 33 (6), Illinois 19 (39), Michigan 15 (61), Minnesota 9 (7), North Dakota 2, Maryland 5 (4), South Carolina 3 (110), Florida 4 (6), Tennessee 2, Louisiana 1, Montana 10, Idaho 1 (10), Utah 12 (1), Washington 29 (43), Oregon 18 (2), California 104 (101), Alaska 4, Hawaii Territory 5 (108).
Lead poisoning: New Mexico 1.
Leprosy: Florida 1, California 2 (5), Hawaii Territory 8 (9).
Lymphocytic choriomeningitis: Tennessee 4 (2).
Lymphogranuloma venereum: Missouri 12 (2), Florida 21 (51), Tennessee 41 (18), Louisiana 42 (45), Utah 1 (1).
Psittacosis: Illinois 7 (1).
Puerperal septicemia: Mississippi 70 (65).
Rabies in animals: New York 224 (184), Pennsylvania 4, Ohio 228 (197), Illinois 101 (103), Michigan 2 (12), Iowa 10 (28), Kansas 14 (5), Delaware 1, Maryland 8 (7), District of Columbia 3 (56), West Virginia 1, South Carolina 44 (40), Florida 4 (3), Alabama 233 (81), Arkansas 42 (50), Louisiana 20 (59), Texas 218 (228), New Mexico 7 (3), Utah 1 (5), Oregon 1, California 102 (132).
Rat bite fever: Georgia 1, Tennessee 1.
Relapsing fever: Pennsylvania 3 (1), Texas 10 (6), Panama Canal Zone 3.
Ringworm: Pennsylvania 147 (290), Ohio 20, Indiana 12, Illinois 1,025, Michigan 228 (583), Minnesota 87, Iowa 10, Kansas 3, Montana 4 (4), Idaho 14, Wyoming 1, Washington 232 (95).
Scabies: Pennsylvania 84 (24), Michigan 408 (178), Missouri 6, North Dakota 10 (22), Kansas 52 (33), Kentucky 8, Montana 22 (32), Idaho 64, Wyoming 1 (3), Nevada 24.
Silicosis: New Hampshire 1, New Mexico 3, Utah 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 11, 1946

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	1	0	4	0	0	5
New Hampshire:												
Concord	0	0	------	0	------	0	0	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	1	0	0	0	0	0	0	------
Massachusetts:												
Boston	6	0	------	0	381	0	7	0	49	0	0	19
Fall River	0	0	------	0	104	0	0	0	4	0	0	3
Springfield	0	0	------	0	79	0	1	0	9	0	0	------
Worcester	0	0	------	0	401	0	5	0	7	0	0	22
Rhode Island:												
Providence	0	0	------	0	20	1	2	0	6	0	0	16
Connecticut:												
Bridgeport	0	0	------	0	3	0	1	0	1	0	0	1
Hartford	1	0	------	0	8	0	0	0	3	0	0	3
New Haven	0	0	------	0	90	0	1	0	0	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	4	0	------	0	100	1	4	0	12	0	0	10
New York	7	0	5	0	1,199	5	43	2	343	0	0	34
Rochester	0	0	------	0	310	0	5	0	25	0	0	2
Syracuse	0	0	------	0	18	1	1	0	5	0	0	1
New Jersey:												
Camden	2	0	------	0	51	1	2	0	0	0	0	6
Newark	0	0	1	1	510	1	6	0	15	0	0	23
Trenton	0	0	------	0	46	0	1	0	4	0	0	7
Pennsylvania:												
Philadelphia	1	0	1	0	500	2	25	0	63	0	1	24
Pittsburgh	0	0	------	0	19	2	7	0	32	0	1	1
Reading	0	0	------	0	12	0	1	0	7	0	0	14
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	3	0	------	1	43	2	4	0	11	0	0	------
Cleveland	1	0	------	1	106	1	9	0	48	0	0	13
Columbus	0	1	------	0	9	0	1	0	10	0	0	3
Indiana:												
Fort Wayne	0	0	------	0	1	0	1	0	2	0	0	------
Indianapolis	0	0	------	0	176	0	7	0	14	0	1	1
South Bend	0	0	------	0	3	0	0		0	0	0	------
Terre Haute	0	0	------	0	9	0	1	0	0	0	0	------
Illinois:												
Chicago	3	0	------	1	296	6	21	0	93	0	0	39
Springfield	0	0	------	------	17	0	0	0	2	0	0	1
Michigan:												
Detroit	5	0	1	0	232	2	13	0	72	0	0	33
Flint	0	0	------	0	19	0	1	0	6	0	0	------
Grand Rapids	0	0	------	0	151	0	0	0	6	0	0	11
Wisconsin:												
Kenosha	0	0	------	0	147	0	0	0	0	0	0	------
Milwaukee	0	0	1	1	1,254	2	8	0	17	0	0	7
Racine	0	0	------	0	54	0	2	0	0	0	0	------
Superior	0	0	------	0	2	0	0	0	0	0	0	4
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	14	0	1	0	2	0	0	1
Minneapolis	3	0	------	0	10	0	1	0	14	0	0	2
St. Paul	0	0	------	0	4	0	2	0	18	0	0	4
Missouri:												
Kansas City	0	0	------	1	5	0	8	0	11	0	0	4
St. Joseph	0	0	------	0	------	0	0	0	3	0	0	------
St. Louis	1	1	1	0	100	0	6	0	6	0	1	3

City reports for week ended May 11, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	42	0	6	0	1	0	0	------
Kansas:												
Topeka	0	0	------	0	7	0	0	0	11	0	0	9
Wichita	0	0	------	0	83	0	1	0	1	0	0	------
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	10	0	1	0	2	0	0	1
Maryland:												
Baltimore	6	0	2	1	457	0	7	0	25	0	0	10
Cumberland	0	0	------	0	------	0	2	0	2	0	0	------
Frederick	1	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	2	0	1	1	338	5	4	0	13	0	1	8
Virginia:												
Lynchburg	0	0	------	0	32	0	0	0	0	0	0	------
Richmond	0	0	------	0	82	0	3	0	7	0	0	4
Roanoke	0	0	------	0	8	0	0	0	0	0	0	3
West Virginia:												
Charleston	0	0	3	0	------	0	0	0	2	0	0	------
Wheeling	0	0	------	0	1	0	2	0	0	0	1	29
North Carolina:												
Raleigh	0	0	------	0	22	0	0	0	1	0	0	------
Wilmington	0	0	------	0	22	0	0	0	0	0	0	------
Winston-Salem	0	0	------	0	16	0	0	0	1	0	0	1
South Carolina:												
Charleston	1	0	1	0	6	0	2	0	1	0	1	1
Georgia:												
Atlanta	0	0	1	0	42	0	3	0	6	0	0	------
Brunswick	0	0	------	0	1	0	0	0	0	0	0	------
Savannah	0	0	1	0	8	0	0	0	0	0	0	------
Florida:												
Tampa	0	0	------	1	44	0	1	3	0	0	1	------
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	0	17	0	14	0	3	0	0	2
Nashville	0	0	------	0	2	0	2	0	0	0	0	------
Alabama:												
Birmingham	1	0	1	0	30	0	1	1	1	0	0	------
Mobile	0	0	------	0	1	1	0	0	1	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	8	0	0	0	1	0	0	------
Louisiana:												
New Orleans	0	0	------	0	20	0	2	0	2	0	1	------
Shreveport	1	0	------	0	------	0	2	0	0	0	0	------
Texas:												
Dallas	1	0	------	0	35	0	1	0	8	0	0	6
Galveston	1	0	------	0	6	0	1	0	0	0	0	------
Houston	1	0	------	0	3	0	4	0	2	0	0	------
San Antonio	0	0	1	1	19	1	2	7	0	0	0	5
MOUNTAIN												
Montana:												
Billings	0	0	------	0	1	0	1	0	0	0	0	------
Great Falls	0	0	------	0	14	0	0	0	0	0	0	------
Helena	0	0	------	0	3	0	0	0	0	0	0	------
Missoula	0	0	------	0	------	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	2	0	0	0	0	0	0	------
Colorado:												
Denver	8	0	1	0	655	0	3	2	15	0	0	17
Pueblo	0	0	------	0	27	0	2	0	0	0	0	------
Utah:												
Salt Lake City	0	0	------	0	121	0	2	0	4	0	0	6

City reports for week ended May 11, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	2	0		0	57	0	5	0	18	0	0	7
Spokane	0	0		0	24	0	2	0	0	0	0	2
Tacoma	0	0		0	4	0	0	0	0	0	0	3
California:												
Los Angeles	3	0	8	2	368	2	1	1	24	0	0	7
Sacramento	1	0		0	241	0	1	0	0	0	0	1
San Francisco	1	0		0	150	3	9	0	20	0	0	4
Total	68	2	30	13	9,563	39	286	16	1,096	0	9	443
Corresponding week, 1945	67		21	17	1,373		285		1,614	0	11	568
Average, 1941-45	59		65	[1] 20	[2] 5,966		[1] 364		1,510	1	15	989

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Boston 1; Philadelphia 1.
Dysentery, amebic.—Cases: New York 1; Detroit 2; St. Louis 1; Pueblo 1; Los Angeles 2.
Dysentery, bacillary.—Cases: New York 2; Chicago 1; Baltimore 1; Charleston, S. C., 3.
Dysentery, unspecified.—Cases: San Antonio 25.
Rocky Mountain spotted fever.—Cases: Roanoke 1.
Tularemia.—Cases: New Orleans 1.
Typhus fever, endemic.—Cases: New Orleans 1; Galveston 1; San Antonio 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 34,366,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	18.3	0.0	0.0	0.0	2,841	2.6	47.1	0.0	217	0.0	0.0	180
Middle Atlantic	6.5	0.0	3.2	0.9	1,280	6.0	44.0	0.9	234	0.0	0.9	56
East North Central	7.3	0.6	1.2	2.4	1,550	7.9	41.3	0.0	171	0.0	0.6	68
West North Central	10.1	2.0	2.0	2.0	533	0.0	50.3	0.0	135	0.0	2.0	46
South Atlantic	16.3	0.0	14.7	4.9	1,780	8.2	40.9	4.9	98	0.0	6.5	93
East South Central	5.9	0.0	5.9	0.0	295	5.9	100.3	5.9	30	0.0	0.0	12
West South Central	11.5	0.0	2.9	2.9	261	2.9	34.4	20.1	37	0.0	2.9	32
Mountain	63.5	0.0	7.9	0.0	6,537	0.0	63.5	15.9	151	0.0	0.0	183
Pacific	11.1	0.0	12.7	3.2	1,335	7.9	28.5	1.6	98	0.0	0.0	38
Total	10.3	0.3	4.6	2.0	1,455	5.9	43.5	2.4	167	0.0	1.4	67

SMALLPOX IN SEATTLE, WASHINGTON

Week Ended May 18, 1946

During the week ended May 18, 2 new cases of smallpox, both fatal, were reported in the Puget Sound area of Washington State. A new focus of the disease was reported in Port Angeles (Clallam County), where one case occurred with onset on May 8, terminating fatally. The source of the infection was stated to be Seattle. One new case, also fatal, with onset on May 9, was reported in Seattle. The total for the State to May 18 is 61 cases, 19 deaths.

No case was reported during the week in San Francisco or in California outside of that city.

FOREIGN REPORTS

BELGIUM

Vital statistics—Years 1940–1945—Inclusive.—For the years 1940 to 1945 inclusive, the following numbers of births and deaths have been reported in Belgium:

Year	Number of live births	Total number of deaths	Deaths of infants under 1 year of age
1940	111,520	133,718	9,508
1941	99,805	121,134	8,405
1942	107,765	121,274	8,277
1943	122,374	110,898	8,217
1944	126,062	131,188	9,442
1945	126,277	119,199	12,017

Population, approximately 8,330,000.

CANADA

Provinces—Communicable diseases—Week ended April 20, 1946.—During the week ended April 20, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		16		76	186	14	11	34	106	443
Diphtheria		8		24	5		1			38
Dysentery, bacillary				5						5
Encephalitis, infectious							1			1
German measles		1		18	62	1		37	8	127
Influenza		10			34	1			47	92
Measles		104	5	545	960	11	2	76	32	1,735
Meningitis, meningococcus				1	2	1				4
Mumps			1	47	213	71	60	41	168	601
Poliomyelitis		2					1			3
Scarlet fever		2	4	77	44	8	5	6	30	176
Tuberculosis (all forms)		3	17	62	45	12	10	15	51	215
Typhoid and paratyphoid fever				3	1			1		5
Undulant fever				1	1	1				3
Venereal diseases:										
Gonorrhea	3	17	6	74	99	85	26	40	53	353
Syphilis		5	3	86	50	11	8	9.	32	204
Whooping cough		22		38	62	6		2		130

JAMAICA

Notifiable diseases—4 weeks ended May 4, 1946.—During the 4 weeks ended May 4, 1946, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1	2	Puerperal sepsis		1
Chickenpox	8	31	Scarlet fever		1
Diphtheria		5	Tuberculosis (pulmonary)	32	66
Dysentery, unspecified	1	6	Typhoid fever	3	106
Erysipelas		1	Typhus fever (murine)	1	
Leprosy		2			

NORWAY

Notifiable diseases—January 1946.—During the month of January 1946, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	26	Mumps	128
Diphtheria	475	Pneumonia (all forms)	4,299
Dysentery, unspecified	6	Poliomyelitis	24
Encephalitis, epidemic	3	Rheumatic fever	251
Erysipelas	481	Scabies	6,456
Gastroenteritis	5,058	Scarlet fever	634
Gonorrhea	741	Syphilis	159
Hepatitis, epidemic	789	Tuberculosis (all forms)	426
Impetigo contagiosa	3,993	Typhoid fever	23
Influenza	8,460	Undulant fever	1
Malaria	2	Weil's disease	4
Measles	3,561	Whooping cough	3,420

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Ceylon—Polonnaruwa.—A report dated May 21, 1946, states that a total of 23 cases of cholera with 10 deaths have occurred in Polonnaruwa, Ceylon. The first cases were reported on May 17, when 9 cases occurred, 4 of which proved fatal on May 21, 1946.

Smallpox

Morocco (French).—For the period April 21–30, 1946, 83 cases of smallpox were reported in French Morocco. Regions reporting the highest incidence are: Agadir and frontier districts, 13; Casablanca, 7; Fez, 14; Marrakech, 32; Meknes, 5; Oujda, 6; Rabat, 6.

Venezuela.—For the month of April 1946, 86 cases of smallpox (alastrim) were reported in Venezuela. States reporting the highest incidence are: Aragua, 15 cases; Federal District, 14 cases; Guarico, 21 cases.

Typhus Fever

Ecuador.—For the month of April 1946, 88 cases of typhus fever with 8 deaths were reported in Ecuador. Cities reporting the highest incidence are: Ambato, 15 cases; Cuenca, 11 cases; Guayaquil, 2 cases of murine typhus; Latacunga, 9 cases; Quito, 25 cases, 6 deaths.

Guatemala.—For the month of March 1946, 64 cases of typhus fever with 9 deaths were reported in Guatemala. Departments reporting the highest incidence are: Chimaltenango, 10 cases, 1 death; Quezaltenango, 8 cases, 2 deaths; Totonicapan, 31 cases, 5 deaths.

Morocco (French).—For the period April 21–30, 1946, 193 cases of typhus fever were reported in French Morocco. Regions reporting the highest incidence are: Agadir and frontier districts, 9; Casablanca, 31; Fez, 50; Marrakech, 33; Meknes, 29; Oujda, 2; Rabat, 39.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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PREVALENCE OF DISEASE

Public Health Reports

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ELECTROCARDIOGRAPHIC ALTERATIONS IN ADULT RATS AS A RESULT OF ACUTE THIAMINE DEFICIENCY[1]

By JAMES M. HUNDLEY, *Senior Assistant Surgeon*, and W. H. SEBRELL, *Medical Director, United States Public Health Service*

Previous communications from this laboratory (*1, 2, 3, 4*) have described the pathologic and electrocardiographic abnormalities that develop in young rats in chronic thiamine deficiency.

It is the purpose of this paper to describe the electrocardiographic changes that develop in adult rats in acute thiamine deprivation.

METHODS

Two groups of rats were studied. One group consisted of 24 female rats approximately 9 months of age, which were being discarded from a breeding colony because of their age and reduced fertility. Litter records were not available. Twenty of these were of Buffalo strain and 4 of National Institute of Health strain. Their weights varied from 160 to 270 gm., averaging 195 gm. Eight were used as controls; the remainder were experimental. The animals were matched in control and experimental groups according to weight.

The second group was composed of 22 male rats approximately 9 months of age of Sprague-Dawley strain. They were not litter mates. Their weights varied from 370 to 450 gm. The 4 rats used as controls averaged 404 gm. in body weight; 18 experimental animals averaged 402 gm. An additional group of 12 rats of the same lot was continued on stock rations and served as further controls.

The same purified diet and crystalline vitamin supplements were used as in previous thiamine-heart experiments. (*1, 2*). The diet was composed of casein, leached and alcohol-extracted, 18 percent; sucrose, 73 percent; cod liver oil, 2 percent; cottonseed oil, 3 percent; and salt mixture (O & M), 4 percent. The vitamin supplement was given

[1] From the Division of Physiology, National Institute of Health.

daily in the following amounts: Pyridoxine, 20 micrograms; riboflavin, 50 micrograms; calcium pantothenate, 50 micrograms; nicotinic acid, 1 mg.; and choline, 20 mg. Control animals received 100 micrograms of thiamine daily; the experimental groups received no thiamine.

Experimental rats were continued on this thiamine-deficient regimen until acute symptoms of deficiency developed, at which time they were treated with 50 to 100 micrograms of thiamine subcutaneously and then allowed to develop another acute episode.

Electrocardiograms were taken at the start of the experiment and at biweekly intervals thereafter until the signs of acute, severe thiamine deficiency began to appear. At this time electrocardiograms were taken at frequent intervals before and after therapy.

The apparatus and technique used to secure these electrocardiograms have been fully described in a previous paper (*4*). Briefly, the apparatus consisted of a radio amplifying unit attached to an ordinary string galvanometer electrocardiograph. The three standard leads were taken, using fine copper wires as electrodes. The sensitivity was 1 mv=2 cm., and the camera speed 75 mm. per second.

NORMAL RAT ELECTROCARDIOGRAM

The general contour of the tracings obtained from these rats was similar to that previously described for young rats (*4*). In other respects, however, they were different. The heart rate of the adult animals was slower; the PR and QRS intervals were longer. Furthermore, the male rats differed significantly from the female rats in these adult groups, the males having a slower heart action with longer electrical intervals. Table 1 summarizes the various measurements of the control animals at different ages. At least part of the gradual slowing of the heart rate was due to the lessened excitability of the animals as they became accustomed gradually to the mechanical procedure of taking the tracings. Figures 1 and 11 are normal electrocardiograms.

RESULTS

Body Weight.—After an average of 2 weeks, the females receiving no thiamine began to lose weight. In an average of 34 days (variation 25–40), when they developed their most acute deficiency, the females had lost from an average of 195 to 114 gm. Following treatment with 50 micrograms of thiamine they gained up to 129 gm. In an average of 19 days (variation 14–24) after treatment, they developed their second acute deficiency and had an average body weight of 95 gm. The few which were treated and survived after thiamine was given for this second deficiency gained up to an average of 107 gm. before they were killed at the termination of the experiment.

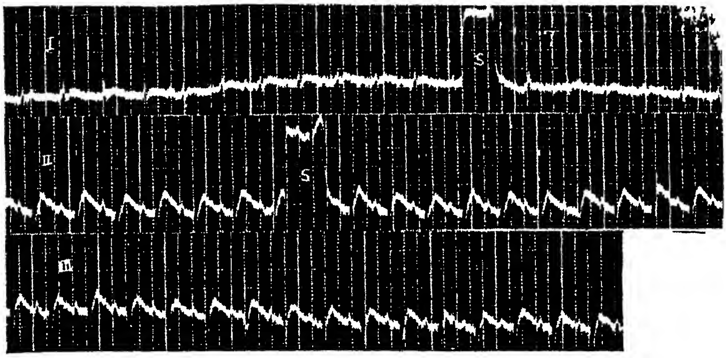

FIGURE 1.—Control rat (20785), 73 days, normal tracing, rate 510/min. PR 0 042 second; QRS 0.013 second; S1 and S3 are present. S=standardization; 1 mv=2 cm. I, II, and III refer to the respective leads

FIGURE 2.—Rat No 20953 early in second acute deficiency; rate 280, PR 0 07, QRS 0.015. Moderate sinus arrhythmia. P waves variable in shape and direction in all leads. The second, third, ninth, and tenth beats in lead II are auricular ectopics.

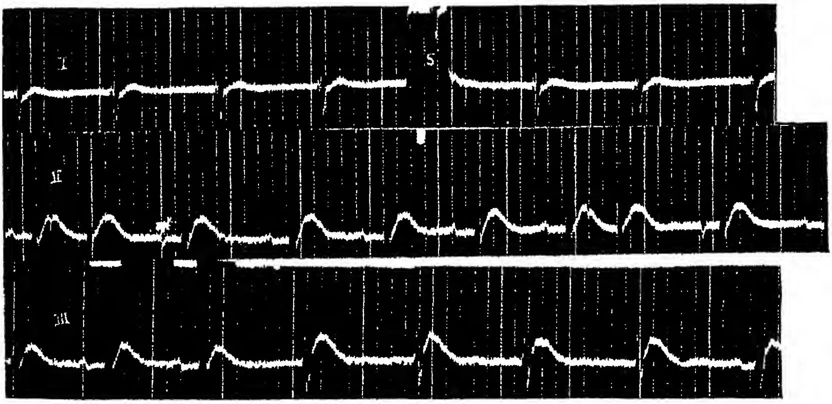

FIGURE 3—Rat No 20953, 24 hours after tracing in figure 2. Second acute deficiency Rate 213, PR 0 06–0 105; QRS 0.018–0.025. Note premature beats and altered P waves in lead II Idioventricular rhythm starts in lead III. (Each of the spaces separated by the light vertical lines equals 0.04 seconds; each of the light horizontal lines equals 1 millimeter.

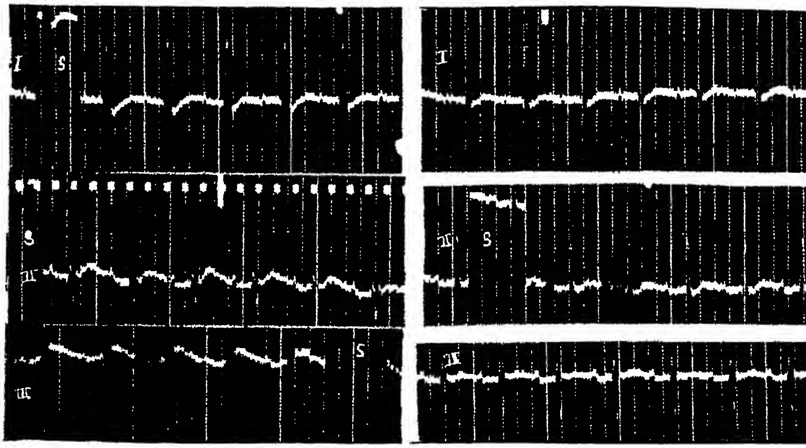

FIGURE 4.—Rat No. 20950. The above tracings were taken after 2 weeks on the thiamine-deficient diet. The tracings on the left show an intraventricular conduction defect (QRS 0.02 second). The tracings on the right were taken a few minutes later, after the left vagus nerve had been cut. Note the change in the width and direction of the initial deflections.

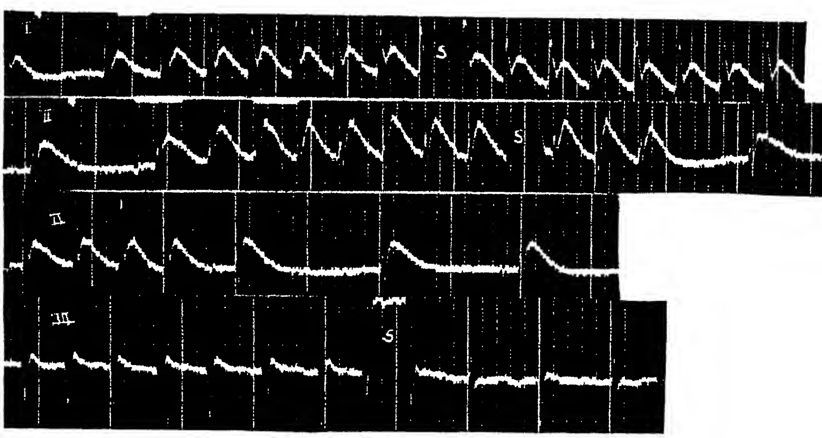

FIGURE 5.—Rat No. 20950 (same rat as above). First acute deficiency. There is a marked arrhythmia due to strings of A–V nodal ectopic beats with an intraventricular conduction defect. Note the variable initial deflections.

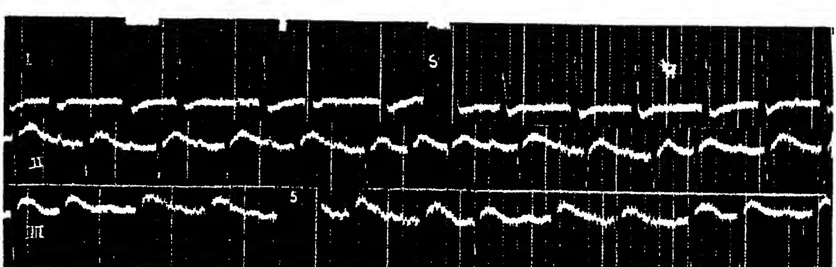

FIGURE 6.—Same rat as above, early in second acute deficiency. Initial deflection is somewhat wide and variable. Occasional distinct P waves can be seen. The rhythm is very irregular, due to A–V nodal ectopic beats.

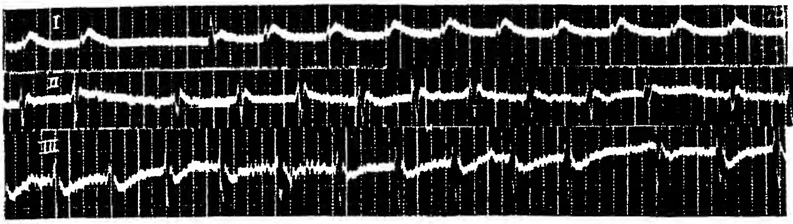

FIGURE 7.—Rat No. 20950, in second acute deficiency. Rate 320 per minute. Initial deflections wide and quite variable. T3 is inverted. The rhythm is grossly irregular No P waves are seen (muscular interference makes positive identification of P waves difficult). This tracing was interpreted as auricular fibrillation (see fig. 8)

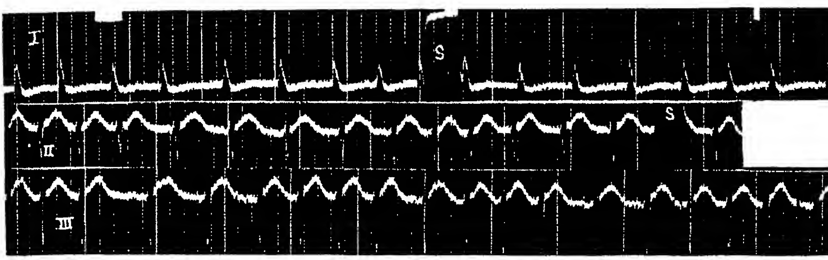

FIGURE 8.—Rat No. 20950 after treatment with 100 micrograms of thiamine daily for 10 days following second acute deficiency. Auricular fibrillation is still present. Heart rate has increased to 430 per minute. P waves absent. T3 now upright. Initial deflections are uniform but still wider than normal.

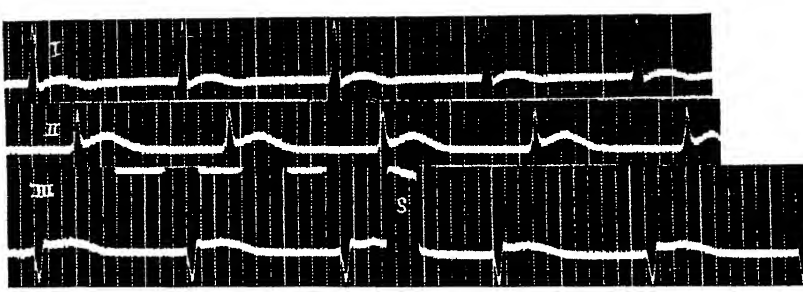

FIGURE 9. Rat No. 20951, 24 hours after treatment for second acute deficiency. Auricular standstill with idioventricular rhythm (initial deflection 0.028 second). Note regular, very slow rhythm (138 per minute), and complete absence of P waves. This rat showed auricular fibrillation with an intraventricular conduction defect before thiamine therapy.

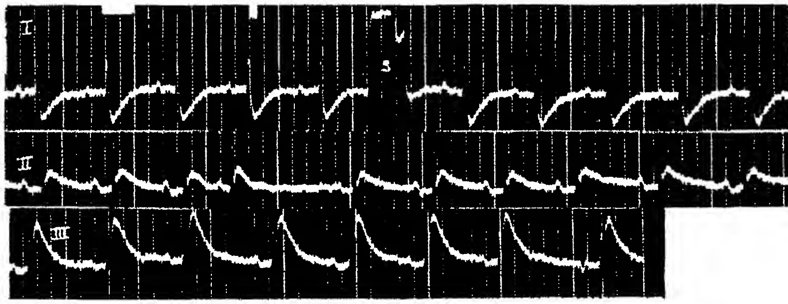

FIGURE 10.—Rat No. 20795. Second acute deficiency; rate 295 per minute; PR 0.06 second; QRS 0.011 second; T1 inverted and low take-off; T3 high take-off, P3 variable; auricular premature beat in lead II.

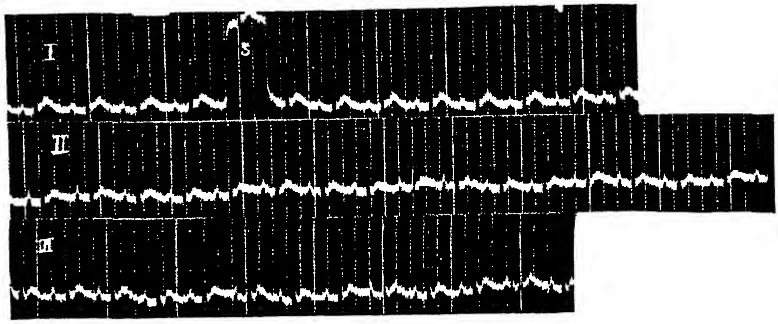

FIGURE 11.—Rat No 20786 (control rat). Normal tracing. Regular, normal sinus rhythm. Rate 460 per minute, PR 0 04 second, QRS 0.009 second.

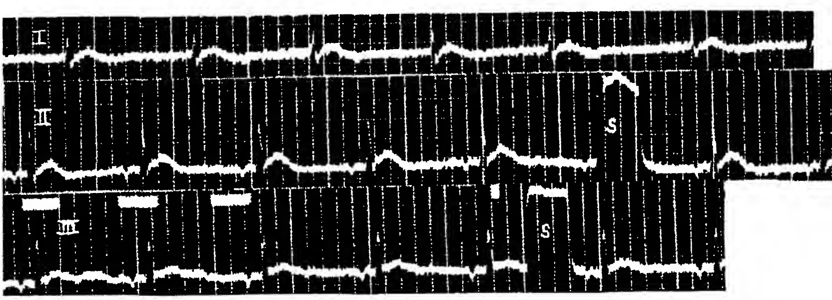

FIGURE 12.—Rat No. 20792. First acute deficiency. Moderate sinus arrhythmia. PR 0.05 second: QRS 0.017 second; P2, 3 inverted.

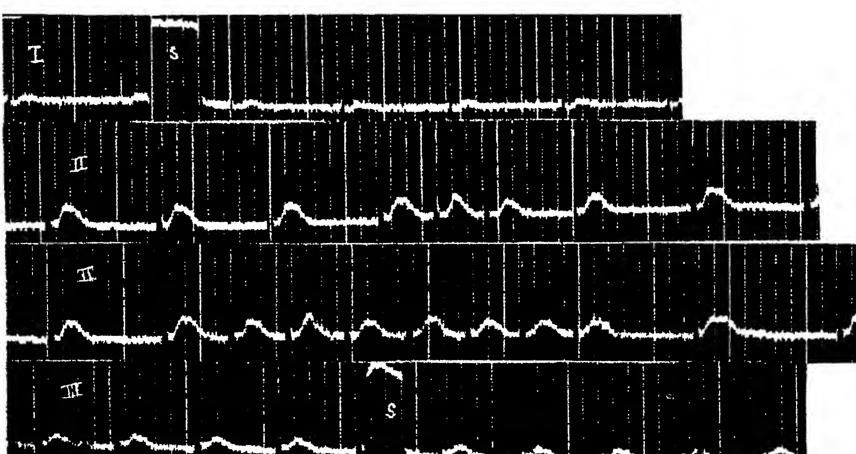

FIGURE 13.—Rat No. 20422. First acute deficiency. Auricular fibrillation. Heart rate 204–333 per minute. Occasional F waves can be seen. After thiamine therapy a nor-

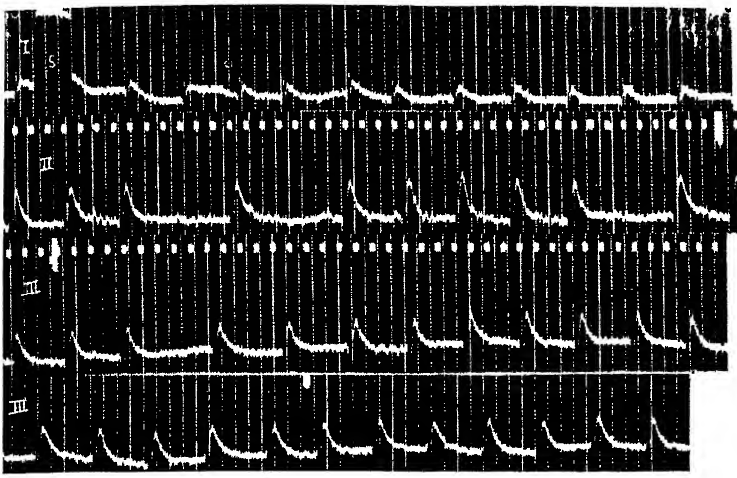

FIGURE 14.—Rat No. 20801 early in first acute deficiency. Auricular fibrillation. Heart rate (approximately) 350 per minute (see figure 15).

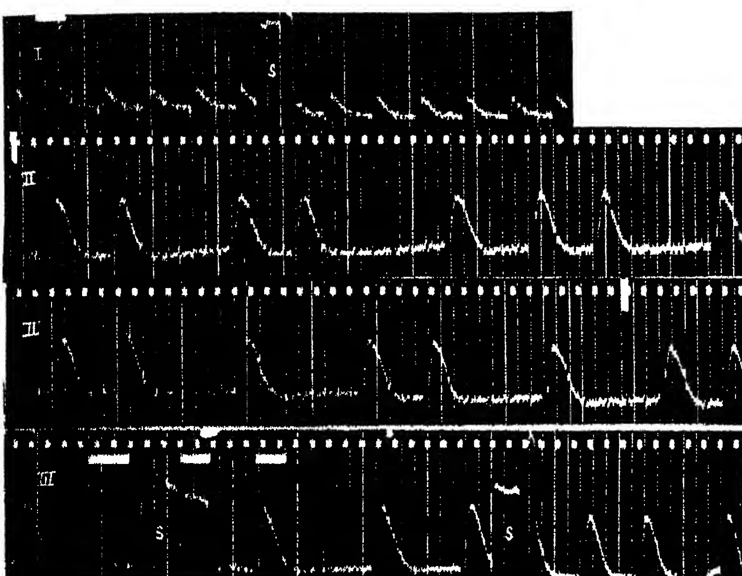

FIGURE 15.—Rat No. 20801. First acute deficiency, 24 hours after figure 14. Auricular fibrillation. Heart rate 200–430 per minute. Note tendency to coupling of beats. Most of the roughness in this tracing is due to muscle spasticity. After thiamine was given the rhythm became regular, with a first degree A–V block (PR 0.08 second), and inverted T1, 2, 3.

TABLE 1.—*Electrocardiographic values for control rats at various ages*

	Start (0 months)				9½ months				10 months				11 months				11½ months			
	Rate[1]	PR	QRS	QT	Rate	PR	QRS	QT	Rate	PR	QRS	QT	Rate	PR	QRS	QT	Rate	PR	QRS	QT
Females:																				
Average	509	0.041	0.011	0 061	491	0.044	0 012	0.064	473	0 043	0.012	0.064	------	------	------	------	484	0 043	0.011	0 064
Variation	430–560	.039–.041	.01–.013	.053–.07	470–540	.04–.05	.011–.014	.06–.07	430–510	.04–.05	.011–.013	.06–.067	------	------	------	------	450–540	.039–.05	.009–.013	.06–.07
Males:																				
Average	450	.046	.012	.066	------	------	------	------	416	.046	.012	.075	435	0.044	0.012	0.07	------	------	------	------
Variation	430–500	.04–.055	.011–.013	.06–.07	------	------	------	------	400–450	.041–.052	.011–.012	.068–.095	425–440	.04–.05	.011–.013	.068–.073	------	------	------	------

[1] Heart rate is given in beats per minute. Other values are given in seconds.

The males began to lose weight after 5 to 10 days on the thiamine-free regimen. After an average of 39 days (variation 33–43) at which time they were in acute, severe deficiency their average body weight had declined from 402 to 200 gm. After thiamine therapy (50–100 micrograms), the average weight rose to 257 gm., but 16 days (variation 15–19) later had fallen to 199 gm. at which time the animals were in their second acute deficiency. Treatment after this deficiency caused body weights to rise to 248 gm. (average).

Two animals, one male and one female, both in the control groups, developed extensive pneumonias and died (or were killed). The pneumonias were confirmed by autopsies. The remainder of both groups of controls maintained or gained in body weight, seemed healthy in all respects, and showed no gross pathology when autopsied at the conclusion of the experiment.

Signs of acute deficiency.—In order to bring out any cardiac changes that might be developing, it was hoped that these rats should become as thiamine-deficient as possible before treatment was given. With young rats acute polyneuropathy makes a convenient end point. With the older rats, however, polyneuropathy seldom occurred in their first deficiency. None of the male rats showed polyneuropathy (spasticity, ataxia, convulsions), and only 8 of the females were observed to develop polyneuropathy in their first deficiency. Consequently, it was necessary to judge the degree of deficiency by loss of body weight, heart rate, weakness, and changes in spontaneous activity. Unfortunately, these signs were neither consistent nor easily evaluated, and several animals died before electrocardiograms were taken; others became so deficient that they would not respond when thiamine was given, while others were treated too early.

In their second deficiencies nearly all the animals, both male and female, showed acute polyneuropathy, and thiamine therapy was more uniformly successful.

Heart rate.—The heart rates of the control animals are shown in table 1. Rates of both the experimental groups remained at approximately the control level until 7 to 10 days before acute deficiency occurred, even though the animals had been losing weight steadily for 2 weeks or more.

As the deficiency became more severe, the heart rates gradually slowed to an average of 285 (variation 155–346) in the females, and 263 (variation 187–346) in the males at the time thiamine therapy was given. Following treatment the heart rate responded well in most of the females, reaching an average of 457 (variation 390–580), 24 to 72 hours after therapy. Males responded less well, reaching an average of 371 (variation 246–450).

In their second deficiency the average heart rate of the females reached 294 (variation 250–360) and rose to 444 after thiamine was given. In the males the average heart rate in their second deficiency was 243 (variation 110–320), rising to 354 (variation 138–425) after treatment.

The heart rates as well as other data for individual animals are given in tables 2 and 3.

Rhythm.—The regular rhythm shown by these rats in the early part of the experiment became disturbed in a variety of ways as the deficiency progressed (see tables 2 and 3). Some degree of sinus arrhythmia was common (figs. 2 and 12). Marked sinus arrhythmia with 50–75 percent variations in successive PR intervals was seen in a few of the animals. Sinus arrest was also common, being followed by ectopic beats of auricular or A-V nodal origin. In a few animals premature beats of auricular or A-V nodal origin occurred (figs 2, 3, 5, 6, 10). Ectopic beats, sinus arrest, and sinus arrhythmia usually responded quickly and completely to thiamine administration.

Auricular fibrillation (figs. 13, 14, 15) occurred in two of the females in their first deficiency. Thiamine treatment converted one to a normal sinus mechanism, in the other the animal died in spite of treatment. In the males, auricular fibrillation was found three times (figs. 7, 8). In one rat (20965), this arrhythmia occurred in the first deficiency episode and the animal did not respond to thiamine treatment. Two males in their second deficiency (20950, 20951) showed auricular fibrillation. In one of these, thiamine was administered in 100-microgram doses daily for 10 days without altering this abnormal mechanism, although the heart rate increased considerably (fig. 8). In the other rat with auricular fibrillation, thiamine treatment apparently converted the auricular fibrillation to auricular standstill with an idioventricular rhythm (fig. 9).

Electrical axis.—No consistent axis deviation could be demonstrated in any stage of the deficiencies. Many of the male rats, both control and experimental, showed a tendency to left axis deviation.

PR interval.—An increase in the PR conduction time was noted in some animals early in their deficiency before their heart rates had declined appreciably. The figures given in parentheses in table 3 are values obtained after the rats had been on the thiamine-deficient regimen for only 2 weeks (fig. 4). It will be noted that several of the PR intervals are increased as compared to normal values for similar animals (table 1).

During the stage of acute deficiency, just before treatment was given, a marked delay in the PR interval of many of these rats was noted, the values ranging from 0.06 to 0.10 seconds (figs. 2, 3, 10).

TABLE 2.—*Summary of electrocardiographic findings in thiamine-deficient adult females*

Rat No.	During first deficiency[1]				After treatment—findings	During second deficiency				After treatment—findings
	Heart rate	PR	QRS	Other findings		Heart rate	PR	QRS	Other findings	
20790	290 (490)	0.055 (.043)	(?) (.011)	T2, 3 inverted	Died					
20791	333 (560)	.05 (.041)	0.015 (.01)	QRS wide	Rate 420; PR 0.051; QRS 0.011.	250	0.053	0.011	Sinus arrest; auricular and A-V nodular ectopic beats.	Rate 495; PR 0.039; normal sinus rhythm.
20792	195–321 (560)	.05 (.041)	.017 (.013)	Moderate sinus arrhythmia; P2, 3 inverted, QRS wide.	Died					
20793	321 (475)	.048 (.045)	.013 (.012)	T2, 3 inverted	Rate 410; PR 0.048; T2, 3 upright.	280	.042	.012	T2, 3 inverted	Rate 420; PR 0.042; T2, 3 upright.
20794	264 (450)	.045 (.04)	.012 (.013)	Normal	Rate 440; PR 0.041, normal	280	.05	.012	T1, 2, 3 inverted	Died.
20795	340 (450)	.067 (.043)	.016 (.013)	Rhythm irregular; sinus arrest; P2, 3 variable shape and direction.	Rate 450; PR 0.055; QRS 0.008; P3 inverted; otherwise normal.	295	.06	.011	T1 inverted; T3 high; P3 variable; auricular premature beats.	Rate 375; PR 0.05, normal.
20800	250 (500)	.07 (.043)	.013 (.012)	P waves low, variable in shape and direction.	Rate 580; PR 0.05; P2 inverted.	300	.067	.013	T2, 3 inverted	Died.
20801	200–430 (530)	(.047)	.011 (.013)	Auricular fibrillation, high T waves.	Rate 510; PR 0.08; T1, 2, 3 inverted, regular rhythm.				Died	
20802	346 (495)	.055 (.041)	.015 (.013)	QRS wide	Rate 470; PR 0.038, normal				do	
20803	300 (430)	.042 (.042)	.013 (.01)	Normal	Rate 390; PR 0.043, normal	265–310	.063	.012	Rhythm very irregular; strings of A-V nodal extrasystoles; P1, 2, 3±.	Rate 410; PR 0.052; regular rhythm; P waves still variable.
20422	204–333 (440)	(.053)	.013 (.013)	Auricular fibrillation	Died					
20423	155 (500)	.095 (.05)	.02 (.013)	PR increase; QRS wide	do					
20425	290 (415)	.065 (.05)	.02 (.013)	Rhythm irregular; PR variable; strings of A-V nodal and auricular extrasystoles.	Rate 430; PR 0.043; QRS 0.013; regular rhythm.	360	(?)	(?)	Same as first deficiency	Died.

[1] The figures given in parentheses are normal values obtained at the start of the experiment from the same animal. Animals that died without electrocardiograms being obtained at the point of greatest deficiency are not included here.

TABLE 3.—*Summary of electrocardiographic findings in thiamine-deficient adult males*

Rat No.	During first deficiency [1]				After treatment—findings	During second deficiency				After treatment—findings
	Heart rate	PR	QRS	Other findings		Heart rate	PR	QRS	Other findings	
20930	225 (440)	0.07 (.049)	0.018 (.013)	T1, 2, 3, inverted; ST1, 2 depressed.	Died					
20931	255 (440)	.069 (.055)	.012 (.013)	Normal except for PR increase.	do					
20932	250 (450)	.068 (.042)	.012 (.012)	T2 inverted; T3 diphasic	do					
20940	144-230 (480)	.05-.06 (.042)	.012 (.011)	Marked sinus arrhythmia; A-V nodal premature beats; P2 variable±.	Killed					
20941	264 (450)	.063 (.05)	.013 (.013)	PR increase only	Rate 430; PR 0.055 normal sinus rhythm.	290	0.07	0.011	Marked sinus arrhythmia; P2, 3 variable±.	Rate 425; PR .052 P2 still variable.
20942	231 (450)	.09-.10 (.048)	.025 (.016)	Bundle branch block; T1, 2 high; R3 notched.	Killed					
20943	346 (460)	.046 (.045)	.011 (.012)	Normal sinus rhythm	Rate 450; PR 0.05 normal sinus rhythm.	280	.058	.012	T1, 2, 3, inverted; ST1, 2, 3 depressed.	Died.
20950	166-460 (430)	.058 (.055)	.016-.018 (.02)	P2, 3 variable±; strings of A-V nodal premature beats.	Rate 421; QRS 0.018; P waves flat; R2, 3 variable and notched.	320		.019	Auricular fibrillation QRS variable in shape T3 inverted.	Rate 430; QRS 0.015; fast auricular fibrillation.
20951	281 (450)	.052 (.054)	.012 (.011)	Normal sinus rhythm	Rate 246; moderate sinus arrhythmia; T3 variable±	110		.018	Auricular fibrillation ventricular conduction defect.	Rate 138; QRS 0.028 auricular standstill; idioventricular rhythm.
20952	273 (445)	.052 (.045)	(?) (.01)	Normal sinus rhythm	Died					
20953	346 (440)	.066 (.06)	.016 (.015)	PR increase QRS wide	Rate 410; PR 0.065; QRS 0.017.	213	.07-.10	.018-.025	Shifting pacemaker; P2, 3 variable; auricular premature beats; idioventricular rhythm lead 3.	Rate 420; PR 0.065 QRS 0.015; regular rhythm.
20964	273 (475)	Variable (.04)	.014 (.011)	PR 0.039 lead 2, 0.05 lead 3; P2 inverted.	Died					
20965	250 (490)	(.05)	.015 (.012)	Auricular fibrillation T2 diphasic, T3 inverted.	do					

[1] The figures in parentheses are values taken 2 weeks after the rats had been deprived of all thiamine. Only those animals which had electrocardiograms taken in their first acute deficiency episode are included here.

The upper limit of normal for the females was 0.05 seconds, and for the males 0.055 seconds. Higher degrees of blocking with dropped beats or complete block were not observed, however.

In a few rats, (20940, 20942, 20953, 20964), the PR intervals varied considerably from beat to beat.

Thiamine administration effected a prompt return of the PR interval to normal values in most instances.

QRS interval.—Three of the male rats showed increases in the width of their QRS complexes after only 2 weeks on experiment (see table 3, figures in parentheses), reaching values of 0.015, 0.016, and 0.02 seconds (upper limit of normal 0.013). In the rat with a QRS of 0.016 (20942), cutting the right vagus was without effect. In the rat with a QRS of 0.02 (20950), sectioning the left vagus decreased the QRS interval to 0.015 seconds (fig. 4). The rat with a QRS of 0.015 was not treated. Bilateral vagus sectioning was not done in these animals since it invariably has resulted in death from laryngeal collapse in other rats, and it was desired to save these rats to study their QRS pattern in more severe deficiencies.

Seven of the males and six of the females showed widened QRS complexes varying from 0.014 to 0.25 seconds at the time of their most acute deficiency (figs. 2, 3, 9, 12). In most instances there was only widening of the QRS complex, the direction and amplitude of the waves being normal. On one rat, however, 20942, which had shown a PR increase early in the experiment, the QRS interval increased to 0.025 seconds, R_1 increased from 3 mm. to 22 mm. in height, and R_3 changed from +6 mm. to −9 mm., indicating aberrant ventricular conduction. In two rats an idioventricular rhythm with widened QRS complexes developed (figs. 3, 9).

Thiamine administration had little effect on the widened QRS complexes in the males but returned those of the female rats to normal fairly consistently.

QT interval.—No changes in the QT intervals were noted except for those associated with changes in heart rate.

P waves.—P-wave abnormalities were observed in four of the females and six of the males (figs. 2, 3, 10, 12). Most often they were inverted, or varied from positive to negative, sometimes they were abnormally wide, or splintered and occasionally biphasic. Sometimes variable P waves were associated with variable PR intervals (fig. 3). Successive P waves often showed variation in their contour. One of the rats (20950) with variable P waves later developed auricular fibrillation. P-wave changes responded very irregularly to thiamine.

T waves.—Six of the females and seven of the males showed T-wave changes (figs. 7, 10, 15). Most of these were simple inversion or

diphasism. However, two of the females and one of the males showed abnormally high T waves in one or more leads, and one of the males showed a T_3 which was variably positive and negative after thiamine therapy. Most of the rats with T-wave changes died in spite of thiamine therapy. The T waves of the few that lived responded irregularly to thiamine.

The take-off of the T waves was abnormally low in two of the males. Both animals died after thiamine was given. No significance was attached to a moderately elevated T-wave take-off since normal rats often show this phenomenon.

DISCUSSION

Most studies of thiamine deficiency in experimental animals have shown significant cardiac changes only when the animals were kept for relatively long periods on a low thiamine intake. Thus Weiss, Haynes, and Zoll (*5, 6*) accidentally produced a chronic partial deficiency followed by an acute deficiency when they failed initially to autoclave their yeast long enough to destroy the thiamine. These rats showed electrocardiographic changes. Swank, Porter, and Yeomans (*7*) found no cardiac failure in acutely deficient dogs but did find cardiac failure and electrocardiographic as well as pathologic changes in the myocardium of chronically deficient dogs. Swank and Bessey (*8*) found electrocardiographic changes and heart damage only in pigeons chronically deficient in thiamine. Wintrobe et al. (*9, 10*) found pathologic and electrocardiographic changes in both acute and chronic thiamine deficiency in swine. Lowry et al. (*1*) and Ashburn and Lowry (*2*) observed pronounced pathologic changes in rats chronically deficient in thiamine. Other reports from this laboratory on the electrocardiographic findings in thiamine deficiency (*3, 4*) utilized chronically deficient rats.

Each of the above studies used young or relatively young animals. The study reported here shows definitely that electrocardiographic changes do occur in acute thiamine deficiency and in older animals. On the average the changes are somewhat more severe and less amenable to treatment than the changes observed in chronically deficient young rats (*4*), although the basic characteristics of the electrocardiographic manifestations are the same.

It might be expected that the hearts of older rats would be more susceptible to the deleterious effects of thiamine deficiency since studies have shown that the rat's heart spontaneously acquires various types of cardiovascular diseases as the rat ages (*11*). This is quite similar to the picture in man where it is generally accepted that the heart becomes more susceptible to injury and disease with age.

The possible significance of the electrocardiographic abnormalities which occur in thiamine-deficient rats has been discussed in a previous publication (*4*).

SUMMARY

Nine-month-old rats developed a variety of electrocardiographic defects when they became acutely deficient in thiamine.

The changes included bradycardia, sinus arrhythmia, sinus arrest, ectopic beats, delayed auriculoventricular conduction (PR), widened QRS complexes, bundle branch block, auricular fibrillation, idioventricular rhythm, notched, inverted, or otherwise variable P waves, inverted or diphasic T waves, and depression or elevation of the T-wave take-off.

The response of these changes to thiamine therapy was variable. Some revert promptly and completely, others slowly or not at all.

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STUDIES OF THE ACUTE DIARRHEAL DISEASES

XVII. THE SULFONAMIDES IN SHIGELLOSIS [1]

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The relative activity of sulfonamides in shigellosis as observed in treated cases and carriers has been described in preceding reports (*1*, *2*). In vitro studies of sulfonamide sensitivity and determination of sulfonamide levels in the blood and feces of some of the treated patients are discussed in the present report.

IN VITRO TESTS OF SULFONAMIDE SENSITIVITY

The test medium employed was a 1-percent tryptone broth. The sulfonamides were added in the following concentrations: 0.01, 0.05, 0.1, 0.15, 0.25, 0.5, 0.75, 1, 2, 3, 5, 7.5, 10, 15, 25, 50, 75, 100, 150, 200, 300, and 400 mg. per 100 ml. (The higher concentrations of the less soluble compounds were omitted.) An 18-hour broth culture was diluted to an estimated 1,000 organisms per milliliter and 0.1 ml. was used as the inoculum. The actual number of organisms in the inoculum was determined by plate counts. Tests were read after 24- and 48-hour incubation. The amount of growth at 24 hours was estimated by comparison with that in the sulfonamide-free control tube and was recorded as 4+, 3+, 2+, 1+, and ± (ranging from a turbidity equaling that in the control to a questionable beginning clouding). The turbidity standard which matched the control tube at the end of 24 hours was used as the basis of comparison in reading the tests at the end of 48 hours.

In testing the relative sensitivity of organisms isolated from different outbreaks, sulfadiazine only was used. Table 1 shows that the usual

Table 1.—*Lowest concentrations of sulfadiazine causing, in vitro, bacteriostasis of different strains of* Shigellae [1]

Sulfadiazine level in mg. per 100 ml.	Number and percent of strains with no growth or a questionable growth at 24 hours							
	Flexner		Sonne		Schmitz		Shiga	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0.01–1	112	86	9	6	5	42	3	43
1.5–5	15	11	56	40	7	58	2	29
7.5–15	4	3	47	34	0	0	1	14
25–50	0	0	27	20	0	0	1	14
Total	131	100	139	100	12	100	7	100

[1] Flexner and Sonne strains isolated from cases or carriers which failed to respond to chemotherapy are excluded.

[1] The work described in this paper was done under a transfer of funds, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the National Institute of Health of the U. S. Public Health Service.

strains of Flexner organisms were highly sensitive. The growth of some was markedly inhibited by as little as 0.1 mg. of sulfadiazine per 100 ml. and 86 percent were inhibited by 1 mg. or less per 100 ml. The highest concentration of sulfadiazine required for marked bacteriostasis was 10 mg. per 100 ml.; in the 4 tests with growth at this level, the inoculum contained substantially more than the desired 100 organisms. The Sonne strains were notably more resistant. All but 6 percent required more than 1 mg., and 54 percent required more than 5 mg. per 100 ml. for the same degree of bacteriostasis. The Schmitz and Shiga strains were intermediate in their sensitivity as is shown in the table. In the treatment of cases and carriers, the usual Flexner (including Boyd 88) organisms were highly sensitive to sulfonamides, the Schmitz variety was a little more resistant; and Sonne strains clearly more resistant. We have not treated Shiga cases.

There was a wide difference between the usual strains and those isolated from cases or carriers which failed to respond to sulfonamide therapy. Ninety-eight of these resistant strains (31 Flexner and 67 Sonne) were tested. These grew with little if any inhibition in 100 mg. of sulfadiazine per 100 ml.

The relative activity of 8 sulfonamides against 20 *Shigellae* (7 Flexner, 6 Sonne, 4 Schmitz,[3] 3 Shiga) was compared as follows: Identical series of dilutions of all sulfonamides were prepared and were inoculated similarly within the hour. The amount of growth at 24 and 48 hours, when present, was measured by comparison with the same turbidity standard. The response to sulfathiazole (the most active compound) was used in computing the relative levels which gave equal bacteriostasis. For example, if there was no growth at 24 hours and a 2+ growth at 48 hours at a level of 0.25 mg. of sulfathiazole and at a level of 0.5 mg. of sulfadiazine, then the relative levels giving equal bacteriostasis would be sulfathiazole 1 and sulfadiazine 2. The findings with the computed averages are given in table 2. This shows that an average of 1.8 times as much sulfadiazine, twice as much sulfamerazine, and 60 times as much sulfaguanidine as sulfathiazole was required for equal bacteriostasis of *Shigellae*. Since there were these demonstrable variations in bacteriostatic activity in vitro, the sulfonamide levels observed in patients may be weighted according to their relative potency. The factor used for this purpose is given in the last column of the table.

SULFONAMIDE LEVELS IN BLOOD AND FECES

The Bratton and Marshall procedure (*3*) was used for the sulfonamide determinations, with one modification for the tests on feces. It was noted that a turbid filtrate was obtained with the usual technique

TABLE 2.—*Relative in vitro bacteriostatic activity of sulfonamides against different varieties and strains of* Shigellae

Sulfonamide	Relative sulfonamide levels giving equal bacteriostasis of different varieties and strains of *Shigellae*																				Average	Reciprocal of average[1]
	Flexner							Sonne						Schmitz				Shiga				
	1	2	3	4	5	6	7	1	2	3	4	5	6	1	2	3	4	1	2	3		
Sulfathiazole	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0
Sulfadiazine	1.5	2.0	2.0	1.5	1.0	1.3	4.5	1.0	1.3	1.5	2.0	1.0	1.5	1.5	1.0	3.0	2.5	2.0	3.0	2.0	1.8	.556
Sulfapyrazine	1.0	1.1	1.5	1.0	1.0	2.5	1.5	.8	.9	1.0	1.0	.9	1.0	1.0	.5	1.5	1.2	2.0	1.0	1.0	1.2	.833
Sulfamerazine	1.0	2.0	2.0	1.0	1.2	6.7	2.0	1.0	2.0	3.0	1.5	.9	1.5	1.2	1.0	1.5	2.5	4.0	1.2	3.0	2.0	.500
Sulfamethazine	1.0	3.0	3.0	2.5	2.8	1.2	6.0	1.5	2.3	6.7	4.0	2.7	6.0	5.0	7.5	2.8	3.0	4.0	3.0	3.0	3.5	.286
Sulfapyridine	9.0	21.0	15.0	3.3	5.2	6.7	------	------	------	10.0	10.0	6.7	------	10.0	7.5	------	------	5.0	------	------	9.1	.110
Sulfanilamide	------	------	------	------	------	------	100.0	------	50.0	------	------	------	50.0	------	------	75.0	100.0	------	50.0	------	70.8	.014
Sulfaguanidine	35.0	100.0	20.0	50.0	33.3	66.7	100.0	------	75.0	100.0	75.0	------	26.0	20.0	10.0	100.0	100.0	100.0	33.3	50.0	60.7	.016

[1] These factors are used to "weight" the blood and fecal levels according to potency as shown in table 3.

except in stools containing mucus. This led to the addition of egg (beaten yolk and white) to the saponin solution in sufficient amount to give a heavy floccular precipitate on the addition of the acid. The resulting filtrate was either clear or only slightly turbid. Any residual turbidity was measured on the colorimeter and final readings adjusted accordingly. This procedure accurately determined the amount of sulfonamide added to sulfonamide-free fluid feces.

We obtained for examination, not the relatively dry fecal residue, but the soft or fluid feces following a saline laxative. The specimens were collected by aspiration through a rectal tube, thus excluding any possibility of urinary contamination. The blood specimen was drawn shortly after the collection of the fecal specimen. Comparative levels were determined in 358 cases.

Routinely, each fecal specimen was tested in two ways designed to measure respectively the dissolved free and the total free sulfonamide. The first determination was obtained by examining the supernatant fluid of a centrifuged specimen; the second was obtained by using a portion of the whole mixed feces. The former is regarded as the measure of the amount of therapeutically active sulfonamide.

Differences in the sulfonamide levels in the centrifuged and in the whole fecal specimens are illustrated in figure 1. With the usual daily dosage of these drugs the amount of sulfonamide in the feces was such that only a portion was in solution. With four 1-gm. doses of sulfadiazine daily, the average fecal levels were 47.2 mg. per 100 ml. for the whole specimen and 29.4 for the centrifuged preparation.

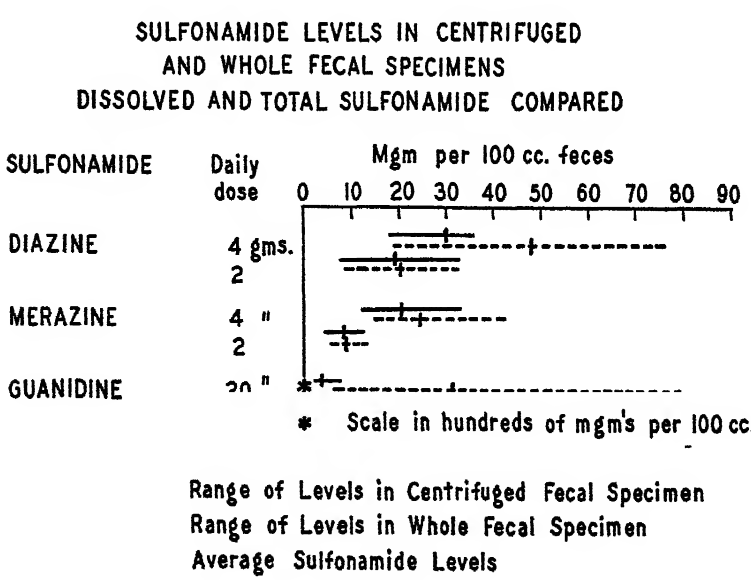

FIGURE 1.

With the more soluble sulfamerazine, the variation was less. When the total daily dosage was low, all or almost all of these sulfonamides were in solution and the two determinations were closely similar. The sulfaguanidine levels were all high, but there was a wide difference between the total amount and the dissolved portion, as is shown.

The levels of dissolved sulfonamide in fluid feces are compared with the blood levels in figure 2. (The observations on five scattered pairs of specimens were substantially below the usual range in the series. These abberrant findings were excluded since they were thought to be related to the difficulties of administering medication to patients in mental hospitals.) The amount of sulfonamide in the blood varied with dosage in accordance with the known characteristics of the respective agents. The fecal levels were two to eight times higher than the blood levels when absorbable sulfonamides other than sulfanilamide had been given. There were wide differences in the blood and fecal levels when the poorly absorbable sulfonamides were used.

THE RANGE OF AND THE AVERAGE SULFONAMIDE LEVELS IN BLOOD AND FLUID FECES

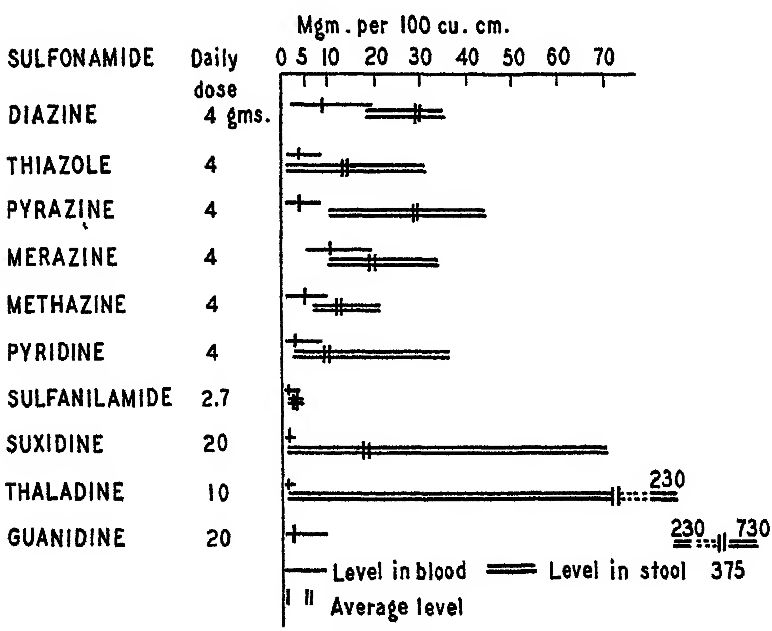

FIGURE 2.

The absorbable compounds with the highest average levels of dissolved sulfonamide in the feces were sulfadiazine and sulfapyrazine. Sulfamerazine, sulfathiazole, sulfamethazine, sulfapyridine, and sul-

fanilamide followed in the order named. The sulfadiazine levels were comparatively uniform from case to case, while there was a marked variation in the levels of sulfathiazole. Patients given sulfasuxidine had moderate but quite variable levels of the dissociated sulfathiazole. The readings were higher in patients who had received sulfathaladine, but these have uncertain significance since sulfathaladine may continue its dissociation in the passed feces. The minimum, average, and maximum fecal levels of sulfaguanidine were all high.

The observed levels need to be evaluated in the light of the demonstrated variations in the bacteriostatic potency of sulfonamides for *Shigellae*. Therefore, the amount of sulfathiazole which would have equal bacteriostatic activity was computed for each finding. The observed and weighted levels are given in the first columns of table 3.

TABLE 3.—*Relative effectiveness of sulfonamides in shigellosis, as indicated by weighted*[1] *sulfonamide levels and as determined in the treatment of cases and carriers*

Sulfonamide	Daily dosage in grams	Average sulfonamide levels in milligrams per 100 ml.						Order of effectiveness in shigellosis	
		Blood		Feces				As indicated by pharmacological findings	As determined in the treatment of cases and carriers
				Average		Minimum			
		Observed	Weighted	Observed	Weighted	Observed	Weighted		
Sulfathiazole	4.0	4.0	4.0	13.0	13.0	4.6	4.6	5	6
Sulfadiazine	4.0	8.0	4.4	29.4	16.3	18.5	10.3	2	2
Sulfapyrazine	4.0	4.2	3.5	29.2	24.3	12.2	10.2	1	1
Sulfamerazine	4.0	10.8	5.6	20.0	10.0	12.5	6.3	4	4
Sulfamethazine	4.0	6.6	1.9	12.7	3.6	7.2	2.1	7	5
Sulfapyridine	4.0	3.5	.4	10.8	1.2	2.0	.2	8	8
Sulfanilamide	2.5	2.7	.04	3.9	.05	2.7	.04	9	9
Sulfaguanidine	20.0	3.5	.06	375.0	6.0	230.0	3.7	6	7
Sulfasuxidine	20.0	.6	.6	19.4	19.4	3.6	3.6	3	3

[1] The factors used to weight the levels according to relative bacteriostatic potency for *Shigellae* are given in the last column of table 2.

Four sulfonamides (sulfapyrazine, sulfathiazole, sulfadiazine, and sulfamerazine) were present in the blood at average levels equivalent to 3.5 to 5.6 mg. of sulfathiazole per 100 ml. These circulating sulfonamides would be expected to be effective for *Shigellae* growing on or in the intestinal wall. It is reasonable to believe that organisms which grow directly on the surface of the mucous membrane, in the crypts, or while actually invading the tissues have major pathogenic importance. The absorbed sulfonamides will reach these through the blood stream and tissue fluids, and, more slowly, from the enteric tract. The sulfonamides with high average weighted levels in the feces were sulfapyrazine, sulfasuxidine, and sulfadiazine. The mini-

mum fecal levels must also be considered since a poor therapeutic response in some individuals could be related to an inadequate concentration of the drug. Sulfadiazine and sulfapyrazine stood above all others with minimum weighted levels above the equivalent of 10 mg. of sulfathiazole per 100 ml. Sulfathiazole, sulfaguanidine, and sulfasuxidine had undesirably low levels in some individuals. According to these data sulfapyrazine and sulfadiazine would be judged the most promising of the absorbable sulfonamides for *Shigella* infections. None of the poorly absorbed compounds had therapeutically effective levels in the blood stream, but sulfasuxidine had a high average fecal level. Sulfaguanidine, in comparison, had low average and minimum weighted fecal levels. The seeming advantage of this compound disappeared when the observed levels were considered in the light of the low activity of the drug.

The order of the effectiveness of the sulfonamides in the treatment of shigellosis is indicated in the last columns of table 3. The rating by the pharmacological findings is based on the total of the three weighted sulfonamide levels as given. The evaluation on cases and carriers was obtained through bacteriological observations on our 1,924 treated infections (*1*, *2*). The findings by these two types of study were in close agreement. Sulfapyrazine and sulfadiazine stand out as the best of the easily absorbed compounds, and sulfasuxidine as the best of the poorly absorbed preparations. Sulfamerazine is next in order of effectiveness while sulfathiazole, sulfamethazine, and sulfaguanidine are the least active of the preparations which might be recommended for shigellosis. Sulfapyridine and sulfanilamide had the lowest ratings.

The relative value of parenterally administered sulfonamides in shigellosis was investigated also. Ten patients were given sodium sulfadiazine and 10 were given sodium sulfapyrazine intravenously. Stool and blood specimens were collected after 4, 8, and 12 hours. At the end of 4 hours the fecal levels were about one-half the blood levels; at the end of 8 hours the blood levels had declined and the fecal levels increased, so all readings were within the same narrow range. At 12 hours the blood levels had declined substantially; the fecal levels only slightly. In only one case in each group did the fecal levels appreciably exceed the 4-hour blood levels. These findings were in marked contrast to a comparable series of cases similarly examined in which the drugs were given by mouth. In these, blood levels were lower and more variable. After 4 hours the concentration of dissolved sulfonamide in the feces varied from less than one-half to more than 5 times that of the blood. The stool levels at the end of 8 hours were all high, varying from 4 to 20 times those of the blood, and at 12 hours these continued to be high. It was evide t that the

high levels of sulfadiazine and sulfapyrazine in the enteric tract were due chiefly to incomplete absorption. Sodium sulfadiazine given parenterally was used in treating 24 children acutely ill with *Shigella* infection. There was a prompt clinical response. While this route of administration may be used to initiate treatment, oral administration with the resulting higher fecal levels is considered superior.

SULFONAMIDE-RESISTANT *SHIGELLAE*

During four of the outbreaks studied, some sulfonamide-resistant *Shigellae* were isolated. There was no apparent spread of the resistant infection in one outbreak and only limited spread in two. Careful isolation was required for control. The outcome was less favorable in the fourth outbreak. Flexner Z infection was first discovered by diagnostic cultures in cases occurring among 32 infants in an institution for the mentally defective. In December 1944, most of these children were ill with acute diarrhea. The symptoms subsided under sulfonamide treatment; the hospital physician discontinued medication on clinical recovery. Neither isolation nor follow-up laboratory examinations were employed. We obtained cultures on all children in the nursery during infrequent visits to the institution. Organisms isolated were examined for sulfonamide sensitivity (there was either marked inhibition by 1 mg. or less of sulfadiazine for 100 ml., or no apparent inhibition by 100 mg.). There were 13 positive cultures on the first survey (December 11, 1944); all organisms were sulfonamide sensitive. Three weeks later (January 5, 1945), 11 or 14 positive cultures were sensitive but 3 were resistant. In the next survey (January 31) 5 of the identified Flexner Z organisms were sensitive and 4 resistant. As of February 13, 1 positive culture was sensitive and 7 were resistant. Subsequently almost all organisms tested were highly resistant. Through transfer from patient to patient this infection was introduced to 3 other groups and spread freely. The sulfonamides were of no value in the treatment or control of this resistant infection. This unusual experience emphasizes the need for appropriate precautions in the use of sulfonamides in shigellosis.

CONCLUSIONS AND RECOMMENDATIONS

In the light of our experience with sulfonamides in shigellosis we have reached the following conclusions:

The sulfonamide of choice for the treatment of shigellosis is sulfadiazine. This drug is effective at a moderate dosage; it has low toxicity and is generally available. Sulfapyrazine also may be highly recommended when available. Of the poorly absorbed sulfonamides sulfasuxidine is the compound of choice.

The recommended dosage of sulfadiazine or sulfapyrazine for adults is 4 gm. daily; of sulfasuxidine 20 gm. daily. These should be given for a minimum period of 7 days, unless the individual has two consecutive negative cultural tests before the end of the period. Smaller doses for a shorter time are effective in most cases, but the larger amounts are recommended to minimize the risk of the development of sulfonamide-resistant organisms.

In acutely ill patients with troublesome vomiting, treatment may be initiated with sodium sulfadiazine given parenterally. Medication should be given by mouth as soon as it can be tolerated.

Where enteric infections spread readily, as among institutional inmates, effective isolation during and following treatment must be required. Patients with infections which fail to respond to sulfonamide treatment need to be isolated with particular care.

Cultures for *Shigellae* should be employed to guide treatment and to regulate isolation. Tests every other day during treatment, beginning on the third day, are adequate. The sulfadiazine treatment may be discontinued on the seventh day and the patient released from isolation when two consecutive cultures are reported as negative. If the cultural test on the seventh or ninth day is positive, a 7-day course of sulfasuxidine warrants trial.

Multiple negative cultures should be obtained before releasing a patient who has had a sulfonamide-resistant infection.

Sulfonamides may be used "prophylactically" in Flexner and Schmitz infections. When the prevalence of the infection is 10 percent or more, the treatment of all individuals is justified. The objective is to free the group of infection. One gram of sulfadiazine twice daily for 7 days is recommended. There should be at least two post-treatment surveys by the culture method, and any individual found positive should be isolated at that time and given full therapeutic doses of sulfonamide. Smaller doses may effectively suppress the development of clinical disease, but this should be recommended only in those emergencies which may occur in military practice.

Chemotherapy is to be used in acute diarrheal diseases with dehydration only when appropriate measures have been taken to restore and maintain normal hydration.

All individuals under treatment must be followed adequately for evidence of early signs of toxicity.

The sulfonamides have a high value in shigellosis, both in the treatment of clinical cases and in the control of the infection.

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FULL-TIME PUBLIC HEALTH POSITIONS IN LOCAL HEALTH DEPARTMENTS [1]

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INTRODUCTION

The first local health departments in this country were in urban areas. As early as 1873, 134 cities had boards of health (*1*). Although most of these early organizations were not under the supervision of full-time health officers, many of the larger cities did have full-time units. This service was extended to the rural population for the first time in 1908 with the establishment of a full-time county health department in Jefferson County, Ky. Two more such departments began operation in 1911, one in Guilford County, N. C., and the other in Yakima County, Wash. (*2*). City-county units were soon organized and later two or more cities or counties were sometimes combined into district units. There has been a steady growth both in the number of local full-time health departments and in the number of political units served by such departments. By 1945, there were 1,160 full-time local health departments serving approximately 2,100 cities and counties (*3*). It has been estimated that about two-thirds of the people in the country live in communities served by full-time local health departments (*4*).

Health departments differ greatly both in the numbers and types of personnel employed. Studies have been made of the number of personnel of different types in all local health departments (*4, 5*) but no reports have been published on the pattern of individual health department organization and the relation between size of staff and population served. To study these aspects of the problem, use has been made of some of the data obtained in a survey of full-time professional and technical personnel in State and full-time local health departments sponsored by the Surgeon General's Committee on Postwar Training of Public Health Personnel in July 1945.

[1] From the Division of Public Health Methods.

MATERIAL AND METHOD

The survey questionnaire was sent to all local health departments listed in the 1945 Directory of Full-time Local Health Officers (6). Returns were received from 933 units or about 80 percent of all full-time local health departments. Table 1 shows the variation in the percent of returns from different parts of the country and from communities of different sizes. The variation was not great from one section to the other except for the Northeast. With regard to size, the variation was also small. On the whole, the returns seem to be fairly representative of all local full-time health departments with respect to location and size of community.

TABLE 1.—*Percent of local health departments returning questionnaires, by geographic area* [1] *and population size-group*

Population size-group	Total	Northeast	South	Central	West
Total	81	71	81	85	83
Under 25,000	79	62	87	82	67
25,000–49,999	82	65	82	88	86
50,000–99,999	79	73	79	84	81
100,000 and over	81	79	71	85	92

[1] Geographic areas include:
Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
South: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, District of Columbia.
Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.
West: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

The questionnaire asked for certain information about 17 specific types of professional and technical public health personnel and for any other types of technical personnel employed by the health departments. Of the information obtained, this report utilizes only the number of established positions of each type (both filled positions and those vacant at the time of the survey).

The data on the population served by each department are from the 1940 Census of Population. The per capita buying income data are for 1942 and were obtained from Sales Management, the Survey of Buying Power Number (7).

The returns show a total of over 17,000 full-time established positions in local health departments. If the 80 percent which returned questionnaires are representative of all full-time local health departments, the estimated number of established positions in all these units would be approximately 21,000.

FINDINGS

Distribution of health departments by size.—The 933 local health departments vary in size from one position (a health officer) to several hundred professional and technical positions (table 2). Almost one-fourth of the health departments have less than 5 positions; approximately one-half have less than 8 positions; and only 4 percent have 50 or more positions.

TABLE 2.—*Distribution of 933 local health departments by number of professional and technical positions on staff*

Number of positions on staff	Number of health departments	Percent distribution	Cumulative percent
All sizes	933	100	
1	11	1	1
2	30	3	4
3	81	9	13
4	104	11	24
5	83	9	33
6	104	11	44
7	61	7	51
8	56	6	57
9	53	6	63
10	47	5	68
11–14	96	10	78
15–19	54	6	84
20–29	67	7	91
30–39	32	3	94
40–49	14	2	96
50–99	21	2	98
100 and over	19	2	100

Ratio of population to total health department positions.—The ratio, population per full-time health department position, was calculated for each local health department, using the total number of established positions for all types of professional and technical personnel in the health department. Figure 1 shows the distribution of 186 city and 735 county units by this ratio. For 12 health departments it was not possible to determine the population served, therefore no ratios could be calculated for these units. The group of city health departments includes also city-county units where the city had a population of 100,000 or more in 1940. The group of county health departments includes also the rest of the city-county units and the State district and local district health departments.

It is apparent from the curves in the figure that the city health departments have more favorable ratios than the county health departments. The median for the city health departments is 4,200 and that for the county health departments is 5,800. For the city health departments, the middle 50 percent of the ratios lie between 3,100 and 5,400. For the county health departments this range extends from 4,100 to 8,300, making the interquartile range almost twice that of the city health departments. The highest ratio for the

city health departments is 23,500 persons per position, while for the county health departments the highest ratio is 137,700.

As might be expected, there is a definite relation between the ratio of population per health department position and the average per capita buying income of the population served. In general, the higher the income, the more favorable the ratio of population to health department positions (table 3). While 17 percent of the high-

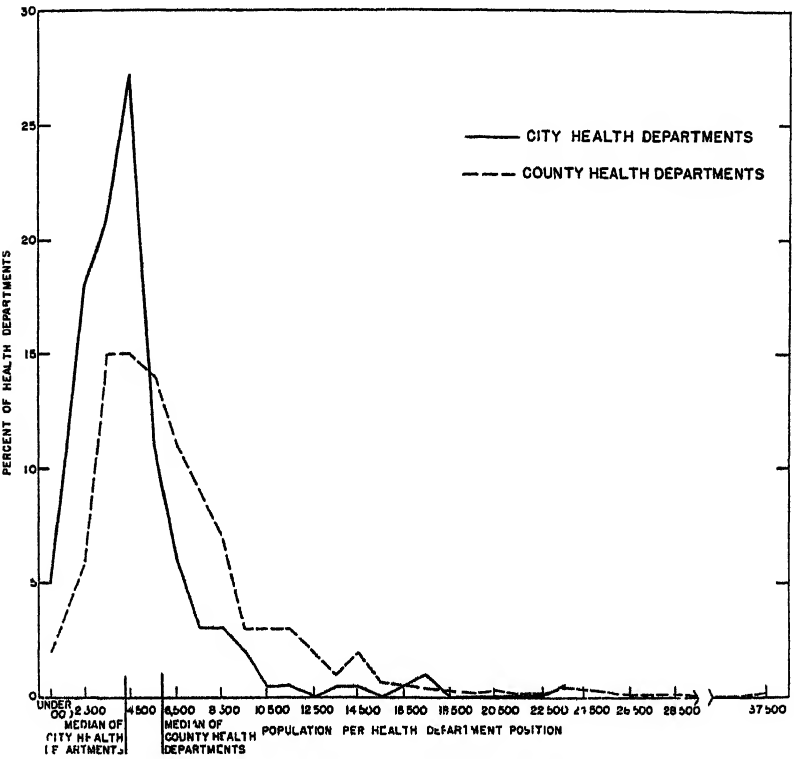

FIGURE 1.—Distribution of 180 city and 735 county health departments by ratio of population served to total professional and technical positions

est income group have ratios of better than 1 professional and technical position per 3,000 population, only 9 percent of the middle and 3 percent of the lowest income groups have such service. Also, 71 percent of the highest, 54 percent of the middle, and only 36 percent of the lowest income groups have ratios more favorable than 1 to 6,000. The median for the lowest income group (6,800) is almost half again as large as that for the highest income group (4,600). The minimum and maximum values show the great range of ratios in all 3 income groups.

Distribution of positions by type.—The 17,000 positions in the health departments returning questionnaires are divided among the different

TABLE 3.—*Distribution of 921 local health departments by ratio of population served to total professional and technical positions for three income groups*

Population per professional and technical position	Annual per capita buying income of population served					
	Number of health departments			Cumulative percent		
	Under $300	$300–699	$700 and over	Under $300	$300–699	$700 and over
Total	183	340	398			
Under 2,000	1	11	15	1	3	4
2,000–2,999	5	19	52	3	9	17
3,000–3,999	15	56	81	11	25	37
4,000–4,999	20	56	87	22	41	58
5,000–5,999	27	47	52	36	54	71
6,000–6,999	31	29	30	53	63	79
7,000–7,999	23	27	20	66	71	84
8,000–8,999	14	31	11	74	80	87
9,000–9,999	11	9	8	80	83	89
10,000–10,999	11	9	4	86	86	90
11,000–11,999	4	9	10	88	89	93
12,000 and over	21	37	28	100	100	100
Median	6,800	5,600	4,600			
Minimum	1,500	1,000	1,000			
Maximum	33,300	90,300	137,700			

types of professional and technical positions as shown in table 4. Graduate nurse positions account for exactly half of all the positions. The next largest groups are: Sanitarians, 11 percent of the total; health officers and other medical positions, 10 percent; and inspectors, 10 percent. Several types of positions, epidemiologists, nutritionists, and chemists, each account for less than 1 percent of the total. It must be remembered that the figures shown do not include full-time positions in health departments under part-time health officers. This is especially important in regard to the number of graduate nurses.

TABLE 4.—*Established full-time positions for different types of public health personnel reported by 933 full-time local health departments*

Type of position	Number reported	Percent distribution
Total	17,192	100
Health officer	940	5
Epidemiologist	88	0.5
Other physician	843	5
Graduate nurse	8,526	50
Sanitary or public health engineer	236	1
Sanitarian	1,810	11
Inspector	1,641	10
Veterinarian	318	2
Dentist	208	1
Statistician	220	1
Health educator	112	1
Nutritionist	60	0.3
Bacteriologist, serologist	436	3
Chemist	70	0.4
Laboratory technician	492	3
X-ray technician	108	1
Other technical	1,084	6

Although the survey questionnaire was meant to include only professional and technical personnel, it is felt that some health departments may have included clerical and other nonprofessional or nontechnical positions in their reports. For example, a number of statistical clerks may have been reported as statisticians.

Composition of health departments.—The total number of employees in a health department does not give the complete picture. Health departments with the same number of employees may differ both in the types of positions included and in the number of each type included. Aside from the health officer, the types of positions most frequently found are those for graduate nurses and sanitation personnel. Few health departments with less than 6 positions have any other type of position than these 3. In spite of the great variation in the composition of health department staffs, it is possible to determine typical patterns of composition for different sizes of health

TABLE 5.—*Percent of health departments of different sizes with specific types of positions*

Number of positions in health department	Number of health departments	Percent of health departments in size-group with one or more positions for—								
		Health officer	Graduate nurse	Sanitation personnel [1]	Medical officer [2]	Laboratory personnel [3]	Statistician	Dentist	Health educator	Nutritionist
1	11	100	-----	-----	-----	-----	-----	-----	-----	-----
2	30	100	77	20	3	-----	-----	-----	-----	-----
3	81	100	96	74	1	2	-----	-----	-----	-----
4	101	100	98	95	7	3	4	3	-----	-----
5	83	100	96	98	7	1	11	4	-----	-----
6–9	274	100	99	95	12	16	5	8	6	3
10–19	197	100	99	98	34	42	15	10	10	3
20–29	67	100	99	97	61	73	30	36	10	6
30–39	32	100	100	97	81	88	34	28	31	3
40–49	14	100	100	100	93	79	43	43	43	21
50 and over	40	100	100	100	95	90	68	38	58	40
All sizes	933	100	97	91	25	27	13	11	9	4

[1] Includes sanitary engineers, sanitarians, inspectors and veterinarians.
[2] Includes epidemiologists and other physicians.
[3] Includes bacteriologists, serologists, chemists, and laboratory technicians.

departments. For example, the typical health department with 5 positions consists of a health officer, a sanitation position and 3 nurse positions. The typical 10-position health department has a health officer, 2 sanitation positions, 6 nurse positions, and a laboratory position.

As the size of health department increases, the number of different types of positions also increases (table 5). With a few exceptions, the proportion of health departments with a particular type of position also increases with size. The proportion of health departments with laboratory positions varies from 0 percent in the departments with only 2 positions to 90 percent in those with 50 or more positions. As was stated before, the data on statisticians must be used cautiously

because of the possible inclusion of subprofessional personnel in this group.

Since nurses and sanitation personnel constitute a large part of the staffs of health departments of all sizes and are practically the only type of personnel, in addition to the health officer, employed in small health departments, the ratios of population to these positions are important measures of the adequacy of health department staffs. Therefore, these two ratios were computed for all health departments for which the population served is known.

Ratio of population to graduate nurse positions.—The distribution of health departments by this ratio is shown in table 6. It will be seen that 29 health departments or 3 percent of the total have no graduate nurse positions. Another 17 percent have ratios of 20,000 persons or more per nurse position. The median of the distribution is 10,800. The whole distribution is considerably skewed in the direction of the higher ratios. This skewness is caused by a small number of health departments with extremely large ratios.

TABLE 6.—*Distribution of 921 local health departments by ratio of population served to graduate nurse positions*

Population per graduate nurse position	Number of health departments	Percent distribution
Total with known population	921	100
Under 4,000	36	4
4,000–5,999	108	12
6,000–7,999	132	14
8,000–9,999	142	16
10,000–11,999	121	13
12,000–13,999	84	9
14,000–15,999	47	5
16,000–17,999	41	4
18,000–19,999	25	3
20,000 and over	156	17
No graduate nurse positions	20	3
Median	10,800	
Minimum	1,700	
Maximum	413,000	

Ratio of population to sanitation positions.—Table 7 shows the distribution of health departments by the ratio of population to total sanitation positions. Included are both professional sanitation positions (engineers and veterinarians) and nonprofessional positions (sanitarians and inspectors). Nine percent of the health departments have no positions for sanitation personnel. Twelve percent have ratios of 50,000 or more persons per sanitation position. On the other hand, 8 percent have ratios of less than 10,000 persons. The median is 24,800. As with the distribution of graduate nurse positions, the distribution is skewed in the direction of the higher ratios.

TABLE 7.—*Distribution of 921 local health departments by ratio of population served to sanitation positions*

Population per sanitation position	Number of health departments	Percent distribution
Total with known population	921	100
Under 10,000	74	8
10,000–14,999	142	16
15,000–19,999	129	14
20,000–24,999	121	13
25,000–29,999	95	10
30,000–34,999	66	7
35,000–39,999	48	5
40,000–44,999	31	3
45,000–49,999	26	3
50,000 and over	111	12
No sanitation positions	78	9
Median	24,800	
Minimum	2,700	
Maximum	413,000	

In fact, the two distributions are quite similar in character although most of the graduate nurse ratios are much smaller than the sanitation personnel ratios.

SUMMARY

Use has been made of data obtained from a survey of full-time professional and technical public health personnel by the Surgeon General's Committee on Postwar Training of Public Health Personnel in 1945 to study the pattern of local health department organization and the relation between size of staff and the population served. The most important points brought out by the analysis are:

1. Approximately one-half of the local health departments in the survey have less than eight full-time professional and technical positions.
2. City health departments have more favorable ratios of population to total health department positions than do county health departments.
3. There is a definite relation between the ratio of population per health department position and the average per capita buying income of the population served; higher incomes being associated with more favorable ratios.
4. Half of the full-time professional and technical positions in local health departments are for graduate nurses.
5. The majority of small health departments employ only a health officer, a sanitation worker, and one or more graduate nurses.
6. The median ratio of population to graduate nurse positions is 10,800.
7. The median ratio of population to sanitation positions is 24,800.

DISCUSSION

The data presented in this report show that there is great variation in the composition of health department staffs. While some health departments seem to have adequate staffs, others are extremely understaffed in relation to the population served. It is of interest in this connection to compare the actual distributions of the ratios of population to various types of positions with the standards suggested by the Committee on Local Health Units of the American Public Health Association in a recent report (*4*).

This Committee suggests as a minimum staff, for a health department serving 50,000 persons: A health officer, a trained sanitary or public health engineer, a sanitarian, and 10 public health nurses. This would mean a ratio of 25,000 persons per sanitation position. The median of the actual distribution of health departments by this ratio is 24,800. Therefore, half the health departments have more favorable ratios than the standard suggested by the Committee and half have less favorable ratios.

The number of public health nurses recommended by the Committee would mean a ratio of 5,000 persons per nurse position. The survey questionnaire asked for all graduate nurse positions and not for public health nurses only, therefore the survey data are not quite comparable to the Committee's standard. However, the average ratio of population to graduate nurse positions found in this survey is over twice as great as that recommended by the Committee.

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(*7*) Survey of buying power, 1942. Sales Management, 49:11–322 (May 10, 1943). (Copyright 1943. Further reproduction not licensed.)

TULAREMIA

FIRST CASE TO BE REPORTED IN ALASKA

By Ralph B. Williams, *Director, Division of Public Health Laboratories, Juneau, Alaska*

A period of 8 years has elapsed since Philip and Parker (*1*) and Philip (*2*) isolated *Pasteurella tularensis* from naturally infected rabbit ticks, *Haemaphysalis leporis-palustris*, collected from various hares (*Lepus americanus*) taken in the vicinity of Fairbanks, Alaska. The first group, collected July 19, 1937, consisted of 150 ticks of all stages, from 5 hares. The second group consisted of 6 adults, 48 nymphs, and 76 larvae collected on July 26 from 1 hare which appeared sluggish when shot. The third group comprised 27 nymphs from 1 hare. The collections were triturated with physiologic saline solution. Each suspension was equally divided and inoculated into 2 guinea pigs. The necropsy findings in these guinea pigs were characteristic of tularemia, and pure cultures of *P. tularensis* were isolated and confirmed at the Rocky Mountain Laboratory, Hamilton, Mont. This was the first evidence of the presence of tularemia in the Territory of Alaska.

On May 12, 1939, Mr. J. W. Warwick, field assistant of the United States Bureau of Biological Survey, collected 73 ticks of all stages from 2 hares "in good condition" near Fairbanks, Alaska. Two guinea pigs were inoculated with suspensions of these ticks at the Rocky Mountain Laboratory; both animals succumbed and presented typical pathological lesions of tularemia. A pure culture of *P. tularensis* was isolated.

On June 25, 1945, a blood specimen was received at the Juneau Laboratory, Territorial Department of Health, from Capt. John H. Pinson, Jr., United States Army Medical Corps, for an agglutination test for tularemia. The blood serum was positive in a dilution of 1:1,280. On August 25, 1945, Captain Pinson reported a definite case of tularemia, clinically typical of the ulceroglandular type.

Patient.—J. O.: Age 31 years, meteorologist, Northway, Alaska, was taken ill on June 5 with typical symptoms of influenza. There was an epidemic of a mild type of influenza in the area at that time. His symptoms were headache, orbital pain, generalized aching, fever of 104° F., and a dry bronchial cough. He was confined to his bed at home on June 7. The patient developed swollen, tender axillary and epitrochlear lymph nodes in his left arm. There was a small encrusted lesion on the back of the left middle finger which he stated had been there about a week. The red blood cell count was 4.56 million; white blood cell count, 8,050; hemoglobin, 85 percent (Talquist); differential count—polymorphonuclears, 50 percent; lympho-

cytes, 40 percent; monocytes, 7 percent; stab cells, 2 percent; and juvenile cells, 1 percent. Urinalysis was negative for sugar and albumin. Attempts were negative to culture organisms from the lesion on the finger and from material aspirated from the lymph nodes on egg yolk at the United States Army Air Force Base, Army Transport Command (using a homemade incubator). A blood sample taken June 20, 1945, showed agglutinins against *P. tularensis* to a titer of 1:1,280 when tested at the Juneau Territorial Laboratory.

The patient was treated symptomatically and rapid recovery was made without complications. The lymph nodes gradually receded over a period of 10 days.

The patient gave a history of having skinned numerous muskrats for about 6 weeks prior to onset of symptoms. He paid no particular attention to the livers, although one of his companions thought he had noticed some mottled discoloration in them, but was not sure. No muskrats, beavers, mice, or rabbits were found dead by the patient in the area of trapping operations.

Additional agglutination tests were made on blood specimens collected from the patient on August 25, 1945. The Rocky Mountain Laboratory, Hamilton, Mont., reported that the blood specimen forwarded to the laboratory agglutinated *P. tularensis* completely at 1:640 and partially at 1:1,280.

This is the first recognized human case of tularemia to be reported in the Territory of Alaska. The Division of Public Health Methods of the United States Public Health Service informs us that cases of tularemia have been recognized in 47 States and the District of Columbia (all States except Vermont), and in Japan (1925), Russia (1928), Norway (1929), Canada (1930), Sweden (1931), Austria (1935), Turkey, Czechoslovakia, and Mexico. The disease has been found to have a wide distribution among animal species, but the muskrat has been associated with human infections only in Oregon, Idaho, Montana, New York State, and at Northway on the Upper Tanana River Drainage, Alaska.

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A PERFORMANCE TEST FOR RATING DISHWASHING DETERGENTS [1]

By Edward H. Mann, *Assistant Sanitarian (R)*, and C. C. Ruchhoft, *Principal Chemist, United States Public Health Service*

With the growth of urban populations and a large increase in the number of people traveling and eating out, restaurant sanitation has become an important factor in public health. The importance of multi-use eating utensils in the spread of disease has been demonstrated by extensive experiments conducted by the Army. Information demonstrating the need for better sanitizing practices in handling multi-use utensils is available in the files of many State health departments. The public, because of the increased practice of health departments in grading and placarding eating establishments, is becoming aware of the need for restaurant sanitation. Municipal and State health departments, in increasing numbers, are adopting new ordinances or revising old ones for the control and improvement of sanitation practices in public eating and drinking establishments. With each reduction of permissible utensil bacterial count and each refinement in examining technique, the question of efficient detergent operation in the cleansing of multi-use utensils assumes a greater importance. Unless a utensil is first completely cleaned, proper sterilization is improbable with hot water and steam and impossible with bactericidal chemicals. "Clean" is defined as being free from food soils, greasy films, and hard-water films which may harbor bacteria and protect them from the bactericidal agent which is used later.

Sanitarians in the field of food sanitation have for some time recognized a wide variation in proprietary compounds offered for washing dishes and other equipment in restaurants, bars, and dairies. As a result of the need for a better field criterion for judging detergent efficiency, this station has undertaken a very careful laboratory study of detergents. This report presents a laboratory washing-performance test that was developed in the course of this study. The present study was greatly aided by the previous work of Gilcreas and O'Brien (*1*), Tiedeman, and of Hucker (*2*) on detergents and detergent-performance tests. The soiling agent used in this study was proposed by Hucker (*2*). A technique for soiling, baking, examining, washing, rinsing, drying, and re-examining microscope slides to determine accurately the soil-removal efficiency of the various detergents was one of the objectives of the study. The description of the washing machine, photometer, and technique developed for such a test follows.

[1] From the Division of Sanitary Engineering, Water and Sanitation Investigations, Cincinnati, Ohio.

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DEVELOPMENT OF THE PHOTOMETER

Because the human eye is not sensitive enough to grade the amount of soil remaining on a utensil within fine limits, it was necessary to use some photoelectric means for this purpose. It was decided to use standard 1″ x 3″ microscope slides in the washing tests as they were quite uniform, flat, small, and not easily attacked by alkaline solution which might tend to etch and corrode cheaper grades of glass. The photometer (fig. 1) then was designed around the use of this type of slide.

A Weston Model 594 photoelectric cell was used in combination with a G-M Laboratories Galvanometer (catalog No. 2561-D). Various arrangements of lenses, light sources, and diffusing filters were tried before the best combination was found.

In the first models built, one slide was examined at a time, the arrangement being quite simple. A small 3.5-volt light bulb was used as a light source. This light was passed through a 1″ x 3″ microscope slide which had been frosted on both sides so as to diffuse the light over the 1″ x 3″ area. The light then passed through the slide used in the washing test and subsequently into the photoelectric cell. This arrangement proved unsatisfactory for two reasons: First, the light was not uniformly distributed before passing through the slide in question, and second, after passing through the soiled slide the light was broken up into light and dark areas because of uneven distribution of soil over the entire area of the slide.

To remedy the uneven distribution of light a lens was placed between the slide and the photoelectric cell to focus the image of the slide into the opening of the cell. This eliminated the difficulty arising from uneven light distribution but reduced the sensitivity because the entire area of the photoelectric cell was not covered by the light.

The lens was replaced by a second diffusing glass which was found to increase sensitivity, though only a part of the transmitted light was caught by the cell.

Reading but one slide at a time gave reductions in light transmission too small for meter deflections sufficient for very accurate calculations. This led to rebuilding the instrument on a larger scale and increasing the light source with the view of reading a number of slides at one time. Twelve slides were examined together, but this number was found to be too great to transmit sufficient light to deflect the meter when slides were soiled. By using a 40-watt, 110-volt light bulb in series with a 25-ohm rheostat, six slides were found to give approximately one unit deflection of the meter when soiled, whereas the meter with no slides in it read full-scale deflection. To eliminate further any uneven distribution of light passage through the instrument, a

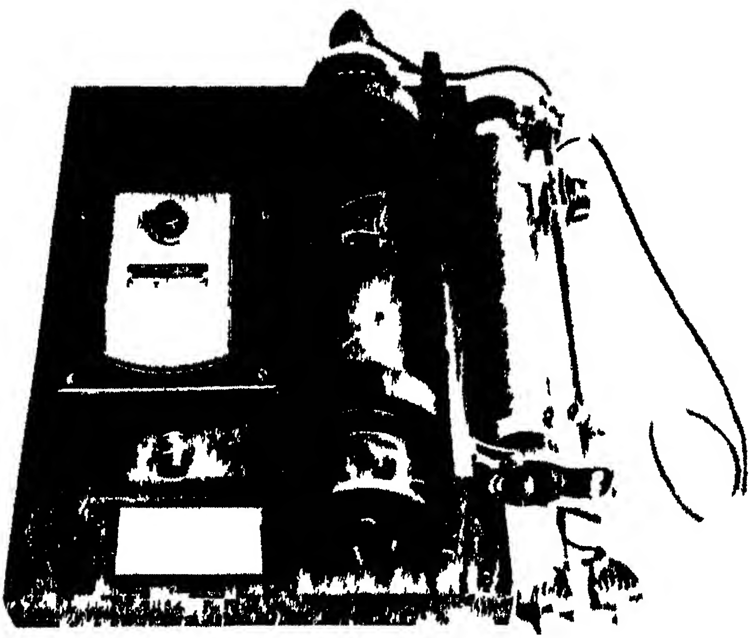

FIGURE 1. The detergent efficiency photometer

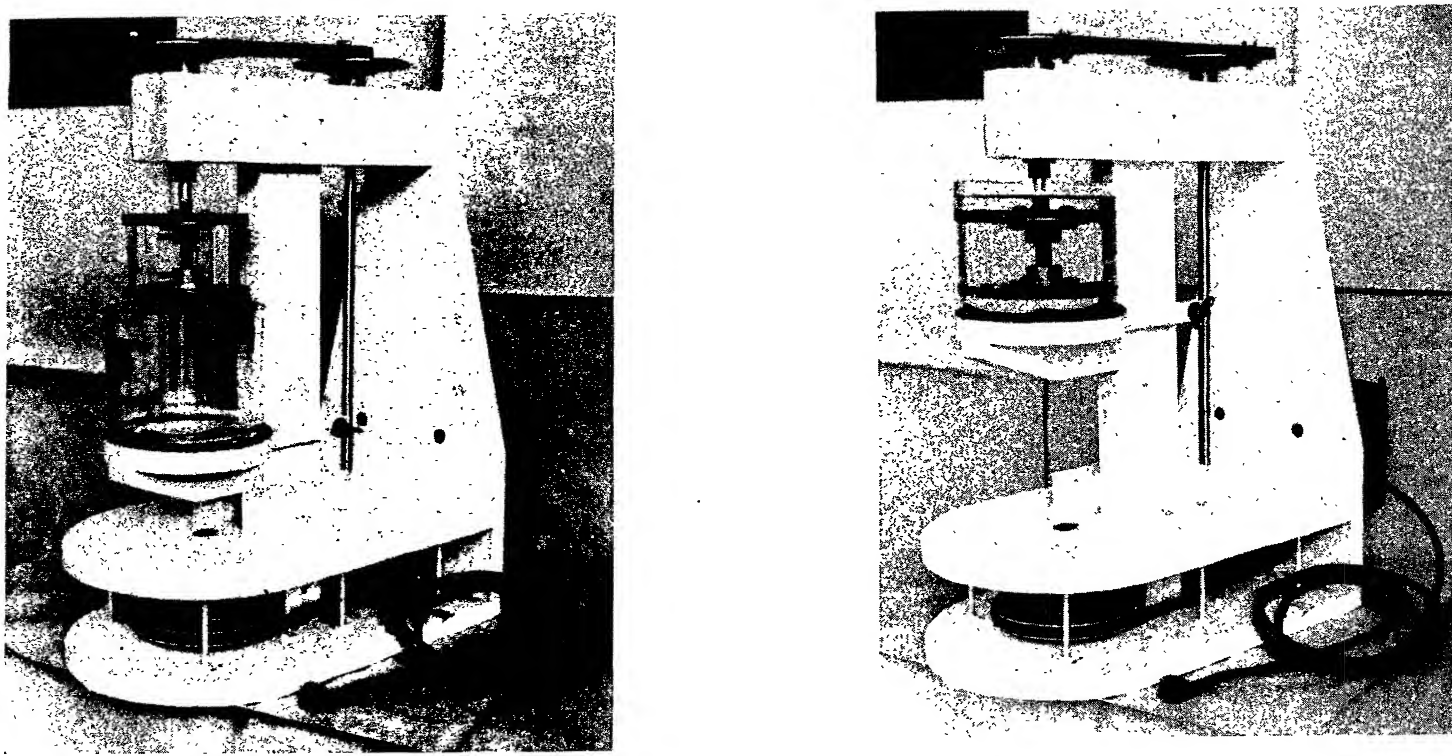

FIGURE 2.—Experimental dishwashing machine.

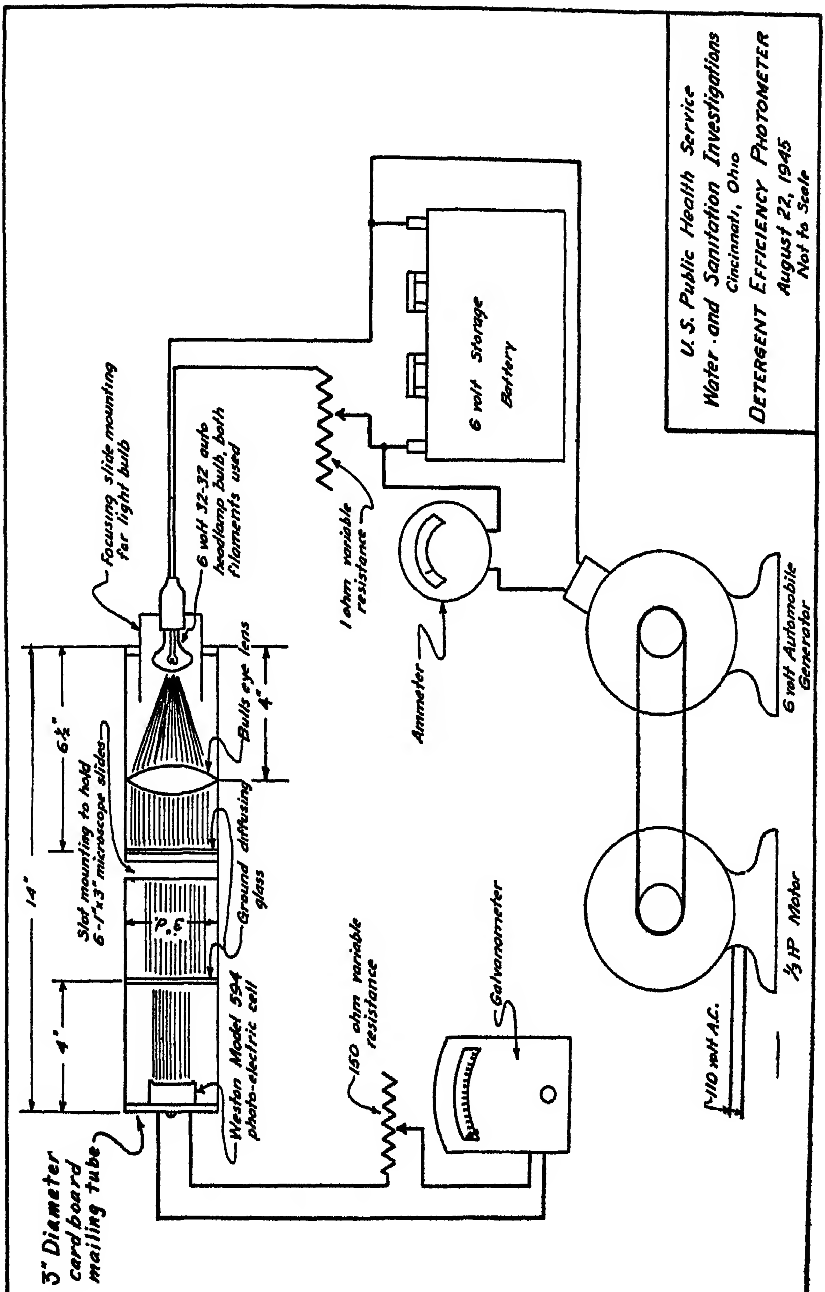
U. S. Public Health Service
Water and Sanitation Investigations
Cincinnati, Ohio
DETERGENT EFFICIENCY PHOTOMETER
August 22, 1945
Not to Scale
6 volt Storage Battery
1 ohm variable resistance
Ammeter
6 volt Automobile Generator
1/3 HP Motor
110 volt A.C.
Galvanometer
150 ohm variable resistance
Focusing slide mounting for light bulb
6 volt 32-32 auto headlamp bulb, both filaments used
Bulls eye lens
Slot mounting to hold 6-1"x3" microscope slides
Ground diffusing glass
P. E.
Weston Model 594 photo-electric cell
3" Diameter cardboard mailing tube
14"
6½"
4"
4"

FIGURE 1A.

convex lens was placed in front of the light source at such distance as to collimate the light into parallel rays. The dimensions given on the arrangement, as shown in figure 1A, were found to give the best results, though it must be kept in mind that because of variations in the focal length, the position of the convex lens may need to be altered when using a different lens in order to insure the emergence of paralleled light.

After use of the instrument, it was found that fluctuations in alternating current line voltage contributed a considerable variation in readings. To eliminate this, an automobile headlight bulb and heavy duty automobile battery were substituted for the 40-watt lamp. To obtain ample light, both filaments had to be used and this required current at the rate of 10 amperes from the storage battery. The high current requirement resulted in a regular drop in meter readings. Constant galvanometer readings were obtained by charging the battery with a 6-volt generator driven by a ⅛-horsepower, 110-volt motor during use of the instrument to compensate for the heavy drain of the battery.

DEVELOPMENT OF EXPERIMENTAL WASHING MACHINE

Numerous experiments were conducted during the development of the present washing machine with the purpose of building a machine which would remove as little soil as possible with distilled water and remove nearly all of the soil with the best detergents available.

Slides were soiled with the soiling agent and baked for 1 hour at approximately 100° C. These were then washed manually in numerous detergents until several samples were segregated which appeared to remove the soil with the greatest ease. These detergents were used in the development of the machine.

The first machine was built to hold twelve 1″ x 3″ standard microscope slides in a circular washing head 5 inches in diameter. The slides were placed in slots set at a 45° angle to a line tangent to the circumference of the head. The head was driven so as to reciprocate through an angular rotation of 120° each half cycle at a speed of 60 cycles per minute. This speed was insufficient to remove the soil by even the better detergents. The speed was increased, holding the rotation angle constant until 120 cycles per minute were reached. This speed failed to give satisfactory results, so the machine was again slowed down and the speed held constant while the arc of rotation was varied. This was increased up to as high as 500° each half cycle. Various combinations of speed and rotational arc were tried. It was found possible to increase the speed and rotational arc sufficiently to remove a considerable percentage of soil by hot water and mechanical action alone.

The combination giving the best results was determined to be a speed of 90 cycles per minute through an arc of rotation of 310° each half cycle. At this speed it was found that the turbulence developed in the detergent solution was great enough to develop vacuum pockets between the slides when 12 were placed in the head at one time. This was eliminated by reducing the number of slides washed at one time to six.

The machine was found later to give slightly better performance by reducing the angle at which the slides were set in the washing head from 45° to 20°. A machine of the design shown in the photographs (fig. 2) and the accompanying diagram (fig. 2A) has a range of soil removal of from approximately 1 percent using distilled water at 140° F., up to approximately 98 percent using 0.3 percent castile soap made up in distilled water at 140° F., followed by a distilled-water rinse.

PREPARATION OF SLIDES FOR WASHING

A standard soiling agent prepared according to the following formula by Hucker (*2*) was used in this test.

Peanut butter	10 gm.
Butter	10 gm.
Lard	10 gm.
Flour	10 gm.
Dehydrated egg yolk	10 gm.
Evaporated milk	15 ml.
Distilled water	50 ml.
Higgins India ink	4 ml.
International printing ink RL3400,[2] diluted 1:1 with boiled linseed oil	10 drops
Copper trichlorphenate (Dowicide K611)	1 gm.
N/1 NaOH	3 ml.

The peanut butter, lard, and butter are melted together and mixed into a smooth paste. The milk and flour are mixed together until homogeneous, and the egg yolk and water are mixed. The egg-yolk mixture and the milk-and-flour mixture are then combined and beaten in a soda fountain malt-mixer for at least 2 minutes at high speed. The Higgins ink is then added and mixing is continued for another 2 minutes. The printing ink-linseed oil mixture is then added to the melted-fat mixture drop by drop while being stirred rapidly. The water mixture is then added to the fat mixture and beaten in the malted-milk mixer for 5 minutes. The Dowicide K611 is mixed with the NaOH and added to the soil during final beating.

Prior to use, one part of distilled water is stirred into five parts of soil to obtain the proper consistency. Several methods of applying the

[2] RL3400 may be secured from the International Printing Ink Division of the Interchemical Company, 432 W. 45th St., New York, N. Y.

soil to the slides were tried, including dipping, brushing on, and rolling on with a rubber roller similar to that used with fingerprinting inks. As the latter method gave the most uniform distribution and smoothest film, it was adopted for use in the test.

The soil is applied as follows: A quantity of soiling agent is poured out on a glass plate about 1 foot square. The rubber roller is brought into contact with the soil and rolled into a thin film over the plate. The roller is then rolled over one side of the slide to apply a thin film of soil. More soil is applied to the roller from the glass plate and the other side of the slide is soiled.

The soil must be baked on the slides; otherwise it is removed too easily. The temperature at which this baking is done is very critical from the standpoint of reproducibility. Numerous experiments were conducted to determine the optimum temperature with the following results:

Starting temperature of oven (baked 1 hr.)	Average soil removal (percent)	
	Distilled water [1]	Castile soap [2]
65° C.	73.4	100 0
70° C.	66.3	100 0
80° C.	50.7	100.0
95° C.	1.0	97.6
100° C.	0.0	59.3

[1] Slides washed in distilled water at 140° F.
[2] Slides washed in 0.3-percent castile soap in distilled water at 140° F.

The temperature of 95° C. was selected for two reasons: (1) It gave the broadest range of removal; and (2) the results were found to be more consistent over the entire detergent range at this temperature than at any other tried.

WASHING TECHNIQUE AND COMPUTATION

The slides to be used in the test first must be washed thoroughly with some good detergent or soap made up in distilled water and rinsed twice in distilled water. They must be dried by either wiping them on a clean dry towel, free from lint and dust, or by rinsing in alcohol and allowing them to dry by evaporation. Slides are afterwards preferably handled only with forceps. The cleaned and dried slides are then sorted into groups of six and placed in wooden slide boxes, the bottoms of which have been cut out, leaving only a ¼″ web strip on each side so as to support the ends of the slides. These boxes are used to support the slides in the oven during baking.

The motor-generator is then turned on and the photometer connected to the battery. Adjust the two variable resistances shown in

figure 1A, until the galvanometer reads full scale with no slides in the instrument. In the case of the galvanometer described above this will be a reading of 60. Allow 2 or 3 minutes for the battery and generator to come to a constant equilibrium and readjust the 1-ohm rheostat, if necessary, to re-establish the full-scale reading. The instrument reading, after this period of time, will usually remain constant. Place each set of six slides in the photometer and record the readings of the slides when clean.

Soil the slides as described above under "Preparation of Slides for Washing." Care must be taken to keep the sets isolated, for all slides are not the same. Place the soiled slides in an oven closely adjusted for 95° C. After the slides are put in the oven the thermometer will record a drop to as low as 85° to 87° C., but will climb back to 94° C. during the baking period of 1 hour. The slides are allowed to remain in the oven for 1 hour from the time they were placed there. As baking temperature must be carefully controlled for reproducible results, in some ovens it may be possible to bake only 1 box of 24 slides at a time due to variations in temperature throughout the oven. In such cases, each box will need to be placed in the same spot in the oven to insure uniformity.

At the end of 1 hour the slides are removed from the oven and allowed to cool for 30 to 40 minutes. When cool, readings are made as before in the photometer on the soiled sets of slides.

Each set of six slides is then placed in the washing head of the washing machine and the solution jar [3] raised around the head. A solution of the detergent to be tested, made up in the concentration recommended, which in most cases is 0.3 percent, is heated to 140° F. and the jar filled with it until the washing head is covered by about ½ inch of solution.

The machine is then turned on and timed with a stop watch, the washing process being carried on for exactly 3 minutes. During these 3 minutes the temperature of the washing solution will drop approximately 8° F. giving an average temperature of 135° F. to 136° F. during the washing.

At the end of the 3-minute washing period the machine is stopped and the jar of detergent removed. An empty jar is now placed around the washing head and the machine turned on and allowed to run for 10 complete cycles. This throws off the excess detergent prior to rinsing.

A third jar is now placed around the head and filled, as before, with boiling water. The machine is turned on and the slides are rinsed for 2 minutes. Boiling water was chosen for the rinse for three reasons: (1)

[3] Convenient washing and rinsing jars for this test were obtained by sawing off 4-liter pyrex serum bottles to give jars 5½ inches in depth.

It meets with the most drastic of sterilization requirements for eating utensils; (2) constant temperature is easily maintained; and (3) water hardness films are deposited more easily than at lower temperatures.

At the end of the 2-minute rinse, the rinsing jar is removed and the machine again turned on and allowed to run for 10 cycles to aid in drying the slides. The slides are now removed and placed in their appropriate place in the slide box to dry.

When dry a third reading is taken on the photometer and recorded as "reading after washing" (col. 7). From these three readings the percentage of soil removed may be calculated. The calculation is illustrated in table 1. It may be pointed out that the detergents used for this demonstration were chosen to show all degrees of washing performance.

TABLE 1.—*Typical examples of efficiency tests*

Detergent 0.3 percent solution	Set of 6 slides No.	Initial meter reading empty	Reading of 6 clean slides	Light absorbed by glass	Reading of 6 soiled slides	Light absorbed by dirt and glass	Light absorbed by dirt	Reading of 6 slides after washing	Light absorbed by residual dirt and glass	Light absorbed by residual dirt	Light absorbed by dirt moved	Soil removed (percent)
Column No.		1	2	3	4	5	6	7	8	9	10	11
Calculations				1—2		1—4	5—3		1—7	8—3	6—9	$\frac{10}{6}\times 100$
A	1	60.0	41.0	19.0	1.0	59.0	40.0	2.5	57.5	38.5	1.5	3.8
B	2	60.0	40.5	19.5	2.5	57.5	38.0	9.0	51.0	31.5	6.5	17.1
C	3	60.0	43.0	17.0	9.0	51.0	34.0	16.0	44.0	27.0	7.0	20.6
D	4	60.0	41.5	18.5	14.0	46.0	27.5	22.0	38.0	19.5	8.0	29.1
E	5	60.0	40.5	19.5	.5	50.5	40.0	14.5	45.5	26.0	14.0	35.0
F	6	60.0	40.5	19.5	1.0	59.0	39.5	21.5	38.5	19.0	20.5	51.9
G	7	60.0	40.0	20.0	1.0	59.0	39.0	29.0	31.0	11.0	28.0	71.8
H	8	60.0	42.5	17.5	10.0	50.0	32.5	34.5	25.5	8.0	24.5	75.4
I	9	60.0	41.0	19.0	1.5	58.5	39.5	36.5	23.5	4.5	35.0	88.6
J	10	60.0	41.0	19.0	1.0	59.0	40.0	40.5	19.5	.5	39.5	98.7

REPRODUCIBILITY OF THE WASHING PERFORMANCE TEST

A number of series of washing performance tests were run, following the technique described, on six detergents showing removal efficiencies from about 2.6 to 100 percent. Tests on distilled water containing no detergent were included in this study. Each series of tests included from 6 to 10 determinations. Table 2 summarizes the data obtained in this study, including the mean and standard deviations and the coefficient of variation. Ten tests with distilled water showed a maximum of 3.8 percent and an average of only 1.02 percent removal. The standard deviation, however, was larger than the mean removal which resulted in a very high coefficient of variation of 122 percent. These 10 runs demonstrate that under the technique of the test it is

impossible to remove more than a very small fraction of the Hucker soil with hot distilled water alone. On the other hand, castile soap in distilled water, which was among the best of the detergents selected for the development of this test, showed from 93.1 to 100 percent removal in 10 tests. Here a very low standard deviation and the lowest coefficient of variation in performance of any of the detergents in this series was obtained. The data demonstrated that every test carried out by this technique using castile soap in distilled water showed a very excellent washing performance.

TABLE 2.—*Data showing the reproducibility of the washing-performance test*

Series No.	Detergent	Number of tests	Percentage of soil removed			Deviations		Coefficient of variation
			Minimum	Maximum	Mean	Mean	Standard	$\frac{S.D.\times 100}{M}$
1	None [1]	10	0.0	3.8	1.02	1.02	1.24	122.0
2	A	8	2.6	8.9	5.9	1.9	2.2	37.3
3	B	7	2.8	23.8	13.8	4.5	5.8	42.0
4	C	8	12.8	50.8	34.2	7.9	10.0	29.2
5	D	6	67.4	74.1	70.7	2.6	2.7	3.8
6	E	10	83.5	94.9	90.1	2.5	3.1	3.4
7	Castile soap	10	93.7	100.0	97.6	1.4	1.8	1.9

[1] In distilled water only.

Further examination of the data indicates that as the average percentage removal by a detergent increases, the coefficient of variation in performance is reduced. This relation between the washing performance of a detergent and the coefficient of variation is shown in figure 3. It may be seen from this figure that with poor detergents having washing performances by this technique under 15 percent, the coefficient of variation will probably exceed 40 percent. As the detergent washing performance increases from 15 percent to 30 percent removal, the coefficient of variation decreases below 40 percent. With removal efficiencies above 30 percent, the coefficient of variation is decreased regularly and seems to be of little importance in detergents with removal efficiencies of 70 percent or more.

Even with the poorer detergents which have larger coefficients of variation there is little possiblity of rating them incorrectly with this test. However, because of the possible variations with single tests, particularly with poor detergents, a minimum of four washing performance tests has been tentatively adopted as a satisfactory basis for studying and rating unknown detergents in our laboratory. The practice of making four washing performance tests by the technique described provides a practical and reliable method of grading detergents.

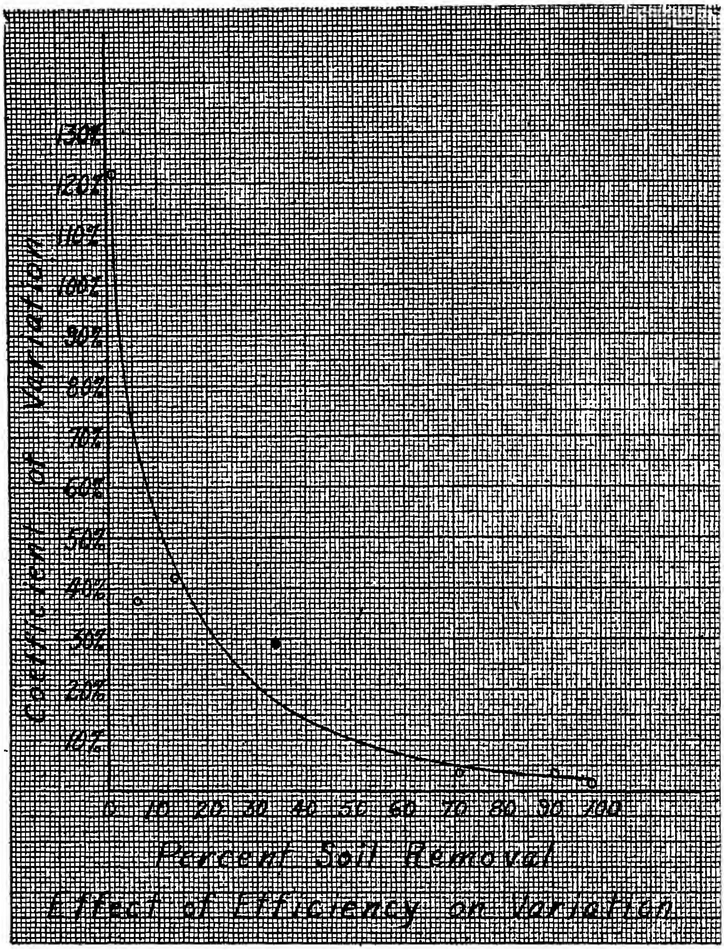

FIGURE 3.

DISCUSSION

It should be stated that the above range of soil removal and degree of reproducibility with detergents will be obtained only if the technique described is adhered to very carefully. Changes in the washing machine, in the photometer, in the composition of the soil used, and in the technique of soiling, baking, washing, rinsing, and the examination of the slides, will all affect the results obtained. Such changes may prevent obtaining a soil removal range from 1.0 percent with plain distilled water to 98 percent with castile soap in distilled water. An increase in the time or temperature of baking will produce a remarkable reduction in the percentage of soil removed. It is therefore especially important to adhere strictly to the stated time and tempera-

ture in baking the soiled slides in preparation for the test. It was also learned that if the same slides are used repeatedly they become scratched. Soiled, scratched slides are harder to wash clean than unscratched slides. Our practice, therefore, is to discard immediately all slides which are noticeably scratched or etched and replace them with new ones for this test.

SUMMARY

A washing-performance test for studying detergents to be used in the cleansing of dishes and utensils in dairy and restaurant sanitization was developed. The standardized technique for soiling, baking, washing, rinsing, drying, and examining standard microscope slides for use in this test has been described in detail. A detailed description of the special washing machine and photometer developed for use in the test has been given. The photometer observations and calculations for determining the soil-removal efficiencies for a number of detergents have been presented. The equipment and technique have been developed so that the percentage of soil removed from the slides increases from about 5 percent for a very poor detergent to 98 percent for a very good one. A statistical study of the reproducibility of the soil-removal efficiencies obtained on a graded scale of detergents has shown that the test developed is a practical and reliable method of grading dishwashing detergents upon a performance basis.

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A SEROLOGICAL STUDY OF 37 CASES OF TSUTSUGAMUSHI DISEASE (SCRUB TYPHUS) OCCURRING IN BURMA AND THE PHILIPPINE ISLANDS [1]

By IDA A. BENGTSON, *Senior Bacteriologist, United States Public Health Service*

Opportunity was afforded through the courtesy of the United States of America Typhus Commission and of members of the Medical Corps, United States Army, of making a serological study of cases of tsutsugamushi fever occurring in Burma and the Philippine Islands during the years 1944 and 1945. Three groups of specimens are considered in this report. The origin of these specimens was as follows:

[1] From the Division of Infectious Diseases, National Institute of Health.

Group 1.—Serums from 15 patients at the Twentieth General Hospital, Burma; received from Lt. Col. James S. Forrester, M. C., Chief of Laboratory Service. They were from an outbreak occurring in May 1944, and the clinical symptoms were of more than usual severity. There was one fatality in this group. In some of these cases no original ulcer could be found. Five or six specimens of serum were collected from each case at weekly intervals. A complete clinical history of all cases accompanied the specimens.

Group 2.—Serums from seven convalescent cases of tsutsugamushi disease; collected by Maj. Theodore E. Woodward at the Ninth General Hospital, Philippine Islands, February 2–7, 1945.

Group 3.—Serums from 15 cases of tsutsugamushi disease occurring in the Philippine Islands in April, May, and June 1945; collected by Maj. Theodore E. Woodward, M. C., United States of America Typhus Commission. Most of these cases were from the Island of Luzon. A clinical history of each case accompanied the specimens.

It has previously been shown (*1*) in a serological study of cases of accidental laboratory infections with known strains of virus and of serums from recovered guinea pigs inoculated with known strains, that higher complement-fixation titers were obtained when antiserums were tested against the infecting strain than when they were tested against other strains. Differences as great as one-thousand- or two-thousand-fold in titers against the homologous strain and a heterologous virus strain (Karp) were obtained in one case of laboratory infection with the Gilliam strain. In recovered guinea pigs there were also marked divergencies in the titers of immune serums from different strains, but the differences were of a lower order.

The testing of serums from a number of cases occurring in localities where the disease is prevalent afforded an opportunity to obtain further information concerning the serological relationship of strains. All serums were tested against antigens prepared from the Karp and Gilliam strains and many were also tested against antigens prepared from the Seerangayee strain. The Karp strain originated from a case in New Guinea and the Seerangayee strain from a case in the Federated Malay States. Both of these strains were furnished by Dr. R. Lewthwaite, of the Federated Malay States. The Gilliam strain was from a case infected in Assam. The tests were performed as previously described (*2*), employing two full units of complement and 37° C. water-bath fixation for 1 hour.

The antigens were prepared from infected yolk sacs as has been previously described (*1*). With increased growth in the yolk sac the aqueous portion of ether-treated material yielded antigens of satisfactory potency. Many of the specimens were tested several times, particularly the serial specimens of group 1. These had been pre-

served by the addition of 1.3 mg. sulfanilamide per cubic centimeter which apparently did not affect the results of the test and which afforded protection against contamination, since none of the serums became anticomplementary. The first tests in this group were made in July 1944 and the last tests in August 1945. While the results obtained were not entirely consistent, owing to the varying potency of the antigens and the difficulty of standardizing them (*1*), still, it was possible to obtain information as to the relationship of the strains used in the tests. The results shown are those in which the same antigens were used throughout the testing of each group of serums, with a few exceptions in group 1 where the sample of antigen had been exhausted.

The results of the tests are shown in tables 1 to 3. Also included are the results of the Weil-Felix test against OXK antigen. In group 1, the results of the Weil-Felix test were furnished by Col. Forrester; in groups 2 and 3 the tests were performed at the National Institute of Health.

In the last column in each table is indicated (by initials) the strain against which highest complement-fixing titers were obtained, K indicating the Karp strain, G the Gilliam strain, and S the Seerangayee strain (tables 1, 2, 3).

TABLE 1.—*Complement-fixation and Weil-Felix reactions of serums from cases of tsutsugamushi disease occurring in Burma* [1]

Case No.	Patient	Serial number of specimen	Approximate date of onset	Date of specimen	Days after onset	Agglutination titer	Complement-fixing titer			
						OXK	Karp	Gilliam	Seerangayee	Classification
			1944	*1944*						
9796	Su 13855	I	May 30	June 12	13	1:25	1:2,048	1:128	--------	K(S)
9797		II		June 19	20	1:100	--------	--------	--------	--------
9798		III		June 26	27	1:50	--------	1:32	--------	--------
9077		IV		July 1	35	1:100	1.2,048	1 8	1:2,048	KS
9978		V		July 12	43	Neg.	1:1,021	1 8	1,024	KS
9979		VI		July 17	48	1:25	1:1,021	1·8	--------	K(S)
9799	Ta 13640 ..	I	May 23	June 12	20	1.25	1:4	1:8,192	--------	G
9800		II		June 19	27	1:25	1.4	1.8,192	--------	G
9801		III		June 29	34	1:50	--------	--------	--------	--------
9802		IV		--------	--------	Neg.	--------	--------	--------	--------
10010		V		July 12	50	1:25	Neg.	1:1,024	Neg.	G
10011		VI		July 17	55	Neg.	1:512	1:256	1:2,048	[2] KGS
9802	Sh 13736 ...	I	May 23	June 12	20	1:100	--------	--------	--------	--------
9803		II		June 19	27	1:50	--------	--------	--------	--------
9804		III		June 26	34	1:50	--------	--------	--------	--------
10003		(III)		June 28	36	--------	Neg.	1:32,768	1:32	G
9994		IV		July 4	42	--------	--------	--------	--------	--------
9995		V		July 10	48	--------	1:8	1:8,192	1:32	G
9996		VI		July 17	55	--------	1:8	1:8,192	1:32	G
9805	Ra 14491......	I	May 31-June 1	June 12	12	Neg.	1:256	1:32	1:2,048	S
9806		II		June 19	19	1:100	--------	--------	--------	--------
9807		III		June 29	26	1:50	1:64	1:8	--------	(S)
10009		(III)		July 1	31	--------	--------	--------	--------	--------

See footnotes at end of table.

TABLE 1.—*Complement-fixation and Weil-Felix reactions of serums from cases of tsutsugamushi disease occurring in Burma*—Continued

Case No.	Patient	Serial number of specimen	Approximate date of onset	Date of specimen	Days after onset	Agglutination titer	Complement-fixing titer			
						OXK	Karp	Gilliam	Seerangayee	Classification
			1944	*1944*						
10006		IV		July 4	34	1:50	--------	--------	--------	--------
10007		V		July 12	42	Neg.	1:16	1:16	1:128	S
10008		VI		July 17	47	Neg.	1:16	1:16	1:128	S
9808	Va 13697------	I	May 25	June 12	18	1:25	--------	--------	--------	--------
9809		II		June 19	25	Neg.	1:16	1:8,192	--------	G
9810		III		June 26	32	Neg.	--------	--------	--------	--------
		IV		--------	------	Neg.	--------	--------	--------	--------
10004		V		July 10	46	Neg.	1:4	1:1,024	1:32	G
10005		VI		July 17	53	1:50	1:4	1:512	1:16	G
9811	Sc 13641	I	May 21	June 12	22	1:400	1:1,024	1:128	1:4,096	KS
9812		II		June 19	29	1:200	--------	--------	--------	--------
9813		III		June 26	36	1:50	1:512	1:128	1:2,048	KS
9980		IV		July 4	44	1:25	1:256	1:32	1:1,024	KS
9981		V		July 10	50	0	1:128	1:64	1:512	KS
9982		VI		July 17	57	0	1:8	1:1,024	1:32	[2] G
9814	Gr 14242-------	I	May 30	June 12	13	1:400	1:2,048	1:256	1:4,096	KS
9815		II		June 19	20	1:1,600	1:2,048	1:256	--------	K(S)
9816		III		June 26	27	1:1,600	--------	--------	--------	--------
9985		IV		--------	------	1:400	--------	--------	--------	--------
9986		V		July 10	41	1:100	1:1,024	1:256	1:4,096	KS
9987		VI		July 17	48	1:100	1:2,048	1:64	1:2,048	KS
9817	Ne 13692------	I	May 21	June 12	22	1:200	--------	1:4,096	--------	G
9818		II		June 19	29	1:100	1:64	1:4,096	1:512	G
9819		III		June 26	36	1:50	--------	--------	--------	--------
9988		IV		July 3	43	1:25	--------	--------	--------	--------
9989		V		July 10	50	Neg.	1:16	1:1,024	1:64	G
9990		VI		July 17	57	Neg.	1:8	1:512	1:64	G
9820	Ba 13903------	I	May 24	June 12	19	1:100	--------	--------	--------	--------
9821		II		June 19	26	1:25	1:2,048	1:256	1:8,192	KS
9822		III		June 26	33	1:50	--------	--------	--------	--------
9991		IV		July 4	41	1:100	--------	--------	--------	--------
9992		V		July 10	47	1:25	1:256	1:64	1:1,024	KS
9993		VI		July 17	54	Neg.	1:64	Neg.	1:512	(K)S
9823	Rh 13779------	I	May 19	June 12	24	1:800	--------	1:65,536	--------	G(S)
9824		II		June 19	31	1:800	--------	--------	--------	--------
9825		III		June 26	38	1:400	--------	--------	--------	--------
9997		IV		July 4	46	1:200	--------	1:8,192	--------	G(S)
9998		V		July 10	52	1:100	1:128	1:4,096	1:16,384	GS
9999		VI		July 17	59	Neg.	1:64	1:2,048	1:8,192	GS
9826	Ma 14016------	I	May 14	June 12	29	1:800	1:32,768	1:32,768	--------	KG(S)
9827		II		June 19	36	1:800	--------	--------	--------	--------
9828		III		June 26	43	1:400	1:512	1:128	1:1,024	KGS
9983		IV		July 4	51	1:200	1:1,024	1:512	1:1,024	KGS
		V		--------	------	1:100	--------	--------	--------	--------
9984		VI		July 17	64	1:50	1:256	1:512	1:1,024	KGS
9829	La 13843-------	I	----------	June 12	------	1:50	1:8,192	1:128	1:128	K
9830		II		June 19	------	1:100	--------	--------	--------	--------
9831	Le 13673-------	I	May 23	June 12	20	1:800	1:8,192	1:1,024	1:65,536	KS
9832		II		June 19	27	1:400	1:16,384	--------	--------	K(S)
9833		III		June 26	34	1:200	1:8,192	1:1,024	--------	K(S)
10000		IV		July 5	43	1:50	--------	--------	--------	--------
10001		V		July 12	50	1:50	1:1,024	1:256	1:8,192	KS
10002		VI		July 17	57	1:25	1:512	1:128	1:4,096	KS
9834	Ca 14474-------	I	May 26	June 12	17	1:100	1:64	1:131,072	--------	G
9835	We 14164------	I	May 24	June 12	19	Neg.	1:4	--------	--------	--------
9836		II		June 19	26	1:50	--------	--------	--------	--------
9837		III		--------	------	--------	Neg.	--------	--------	--------

[1] Collected at the Twentieth General Hospital, June, July 1944 (group 1).
[2] See text p. 889.

TABLE 2.—*Complement-fixation and Weil-Felix reactions of serums from cases of tsutsugamushi disease occurring in the Philippine Islands* [1]

Case No.	Patient	Locality where infection occurred	Date of specimen	Agglutination titer	Complement-fixing titer			
				OXK	Karp	Gilliam	Seerangayee	Classification
10838	Mi	Mindoro	32d day	1:320	1:8,192	1:8,192	1:4,096	KGS
10839	Ba	Sansapor	6th month	Negative	1:16	Negative	1:8	K(G)S
10840	Bu	Wadki Island	2d month	1:20	1:16	1:64	1:64	KGS
10841	Al	Sansapor	4th month	1:20	1:4	1:2,048	1:4	G
10842	Sa	Sansapor	6th month	1:20	1:4	1:512	Negative	G
10843	Lo	Mindoro	33d day	1:640	1:8,192	1:16,384	1:64	KG
10844	Sn	Biak	76th day	Negative	1:16	1:32	1:16	KGS

[1] Collected at the Ninth General Hospital Feb. 2-7, 1945 (group 2).

TABLE 3.—*Complement-fixation and Weil-Felix reactions of serums from cases of tsutsugamushi disease occurring in the Philippine Islands* [1]

Case No.	Patient	Date of onset	Date of specimen	Days after onset	Agglutination titer	Complement-fixing titer			
					OXK	Karp	Gilliam	Seerangayee	Classification
		1945	*1945*						
11272	Os	Apr. 18	May 12	24	1:640	1:8,192	1:8,192	1:4,096	KGS
11273	He	Apr. 18	May 23	35	1:320	1:64	1:32,768	1:64	G
11274	Jp	Apr. 30	May 29	29	1:1,280	1:2,048	1:2,048	1:4,096	KGS
11275	Wm	May 6	May 30	24	1:80	1:2,048	1:128	1:512	KS
11276	Tb	May 7	May 30	23	1:40	1:128	1:128	1:64	KGS
11277	Es	May 6	May 29	23	1:160	1:128	1:2,048	1:64	G
11278	Mz	May 25	June 12	18	1:640	1:2,048	1:128	1:2,048	KS
11279	Hm	May 17	June 12	26	1:320	1:4,096	1:16,384	1:4,096	KGS
11280	Lm	May 27	June 12	16	1:1,280	1:16,384	1:32,768	1:32,768	KGS
11281	Gb	May 16	June 13	28	1:40	1:256	1:256	1:512	KGS
11282	Le	May 13	June 12	30	Negative	1:4	1:8,192	1:32	G
11283	Lg	May 15	June 12	28	1:320	1:32,768	1:8,192	1:4,096	KGS
11284	Cb	May 16	June 12	27	1:640	1:512	1:128	1:512	KGS
11285	Db	May 14	June 12	29	1:320	1:32,768	1:4,096	1:1,024	K
11286	Em	June 1	June 12	11	1:20	1:256	1:8	1:4	K
11287	Hm	May 9	June 12	31	1:320	1:32,768	1:8,192	1:256	KG

[1] Collected June 1945 (group 3).

DISCUSSION

The results of the tests as shown in tables 1, 2, and 3 do not indicate any clear differentiation of serological types as may have been suggested by tests of serums from laboratory cases infected with known strains (*1*). Though a certain number show a decidedly higher complement-fixing titer against either the Karp, Gilliam, or Seerangayee strain, a considerable number of cases have the same or approximately the same titer against all three of the strains used in the preparation of antigens. It therefore appears that the strains may be more closely related than was suggested by the results of tests on serums from cases infected with known strains.

Among the 23 Philippine cases (tables 2 and 3), 12 show the inclusive type of reaction; the antigens from the Karp, Gilliam, and Seeran-

gayee strains reacting to approximately the same titer (KGS). In five cases the Gilliam strain reacted to a decidedly higher titer than the Karp and Seerangayee strains (cases No. 11273, 11277, 11282, 10841, 10842) (G). In two cases (cases No. 11285 and 11286) a considerably higher titer was obtained against the Karp strain than against the Gilliam and Seerangayee strains (K). In two cases (No. 11275 and 11278), titers against the Karp and Seerangayee strain were higher than against the Gilliam strain (KS) and in two others (No. 11287 and 10843) higher titers were obtained against the Karp and Gilliam strains than against the Seerangayee strain (KG).

Among the Burma cases the KGS combination occurs consistently in only one instance (Ma 14016). There are five G cases (Ta 13649, Sh 13736, Va 13697, Ne 13692, Ca 14474); one K case (La 13843); one S case (Ra 14491); five KS cases (Su 13885, Sc 13641, Gr 14242, Ba 13903, Le 13673); one GS case (Rh 13779).

The results are summarized in table 4.

TABLE 4.—*Summary of results of complement-fixation tests*

Predominant antigenic factors	Philippine cases	Burma cases	Total
K	2	1	3
G	5	5	10
S	------	1	1
KGS	12	1	13
KS	2	5	7
KG	2	------	2
GS	------	1	1

The results tabulated in table 4 may be represented graphically as shown in figure 1. All possible combinations of KG and S are represented in the results of the tests on the serums from the 37 cases. It thus appears that the Karp, Gilliam, and Seerangayee strains do not represent separate complement-fixing types but that they are more closely related. Antibodies present in the different serums may contain either one, two, or three major components which react with the corresponding antigens. The great majority of the cases studied had antibodies responding to K or G antigens separately or to each of these together with other antigens. Only one case (Ra 14491) was found to be an S case and the serum from this case had a titer of 1:2,048 with S antigen and 1:256 with K antigen on the twelfth day. Later in the course of the illness these titers were reduced to 1:128 against the S antigen and 1:16 against the K antigen. Thus by the use of the K and G antigens, antibodies would have been detected in all the serums tested. The Gilliam strain appears to be particularly distinctive (*1*), and the Karp strain differs in several respects from the Gilliam strain. It therefore seems

indicated that these two strains should be employed as antigens unless further tests may show that other strains should also be included or unless a strain is found which is of an inclusive nature, so that it will elicit a response from all antibody combinations.

The results obtained with the serial specimens from the Burma cases were fairly consistent throughout, falling in orderly fashion

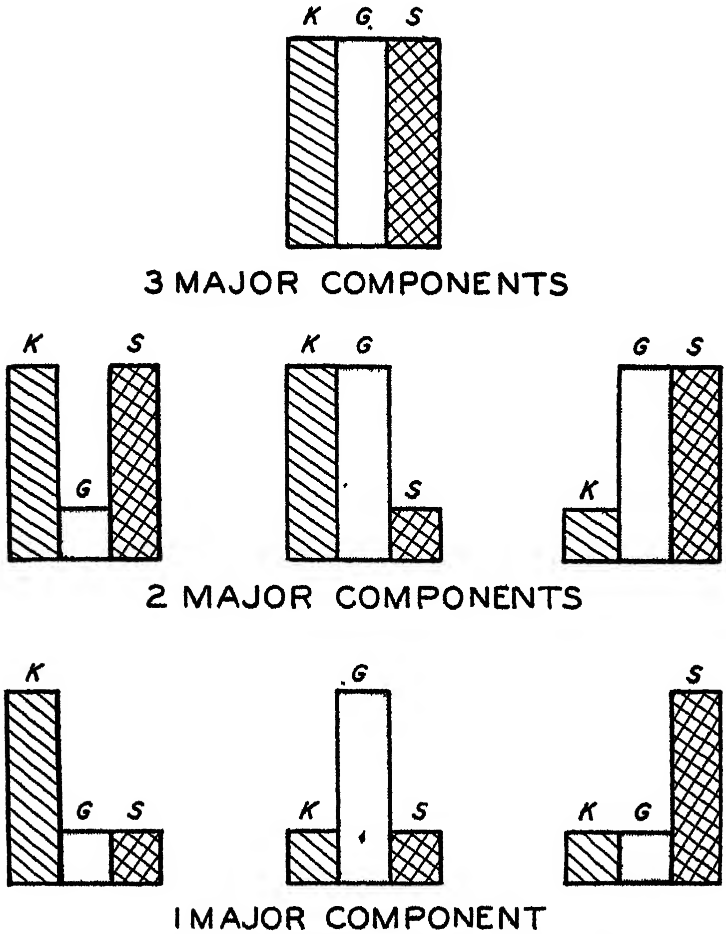

FIGURE 1.—Karp, Gilliam, and Seerangayee antibody patterns.

following initial high titers, with the exception of a few discrepancies which will be considered later. High titers were present in 12, 13, 17, 20, 22, 24, and 27 days (1:2,048, 1:4,096, 1:65,536, 1:131,072). High titers also persisted through 36, 41, 50, 52, 57, and 59 days (1:2,048, 1:4,096, 1:8,192 1:16,384). The highest titer recorded was that of case Ca 14474 which was fatal. The serum collected on the seventeenth day had a titer of 1:131,072.

Two discrepancies (table 1) in the results are noticeable, that of 10011 (specimen 6 of Ta 13649) and 9982 (specimen 6 of Sc 13641). In the first instance unexpectedly high titers were obtained against Karp and Seerangayee antigens whereas negative results against these two antigens had been obtained with a specimen collected 5 days earlier. Likewise specimen 9982 had an unexpectedly high titer against the Gilliam antigen, while the specimen collected 7 days earlier had had a low titer against this strain. Tests were repeated several times with the same and with different antigens, with approximately the same results. No clue to indicate that the specimens had been mislabeled could be found. It is to be noted in both of these cases that titers of the preceding specimens against the other antigens approximated those of the later specimens against the antigens under discussion. If these results are valid it would appear that the relationship between the three strains is still closer than has been suspected.

In general, considerably higher titers were obtained in the complement-fixation test than in the agglutination test using OXK as antigen. Highest titers obtained in the Weil-Felix agglutination test were 1:1,600 (twentieth, twenty-seventh days); 1:1,280 (sixteenth, twenty-ninth days). Significant complement-fixation reactions persisted after the agglutination titer had fallen to negative or 1:20 and 1:40.

SUMMARY

A serological study by complement fixation, of 37 cases of tsutsugamushi disease occurring in Burma and the Philippine Islands revealed a variety of antigenic responses to the three strains of tsutsugamushi used in the tests, namely the Gilliam, Karp, and Seerangayee strains. Certain cases were predominantly of the Gilliam type, others of the Karp or Seerangayee type, and the serums of a number of cases responded equally well to all three types. Cross fixation occurred in practically all cases. The results obtained as a whole do not indicate any clear differentiation of serological types. The Karp and Gilliam strains appear sufficiently distinctive, however, to warrant the use of these two in the testing of serums from cases of suspected tsutsugamushi illness. Weil-Felix titers with OXK antigen were much lower than complement-fixing titers with rickettsial antigens and persisted for a shorter time.

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COMPLEMENT FIXATION IN TSUTSUGAMUSHI DISEASE (SCRUB TYPHUS) [1]

By Ida A. Bengtson, *Senior Bacteriologist, United States Public Health Service*

A complement-fixation test has been developed against a strain of rickettsiae designated as tsutsugamushi Karp along the lines previously described for endemic and epidemic typhus and Q fever (*1*). Various frozen specimens of chick embryo material inoculated with this strain were received from Dr. Lewthwaite (*4*) of the Federated Malay States through the courtesy of the National Naval Medical Research Institute.

The propagation of the strain was continued in yolk sacs of fertile eggs by the Cox method (*2*), by inoculation of mice and guinea pigs, and into the anterior chamber of rabbits' eyes. The growth in the yolk sac was poor at first but as serial passages were continued it improved. Intraperitoneal inoculations in guinea pigs elicited a febrile illness characterized by approximately a 5-day incubation period and fever (above 39.6° C.) for about 4 days. The strain is fatal for white mice when inoculated intraperitoneally with either yolk-sac virus or guinea pig passage material (liver or liver-and-spleen suspension). When yolk-sac passage virus is inoculated into the anterior chamber of the rabbit's eye an iritis and then an ophthalmitis is evoked, similar to that described for tsutsugamushi disease (*3*). Rickettsia-like bodies can be easily demonstrated in the infected yolk sacs, and in various infected animal tissues.

Antigens were prepared from the yolk sacs of infected eggs. Serums from a number of recovered inoculated guinea pigs furnished by Dr. Norman H. Topping [2] and six human convalescent serums were available for testing. Two units of hemolysin, two full units of complement, and four units of antigen (four times the highest dilution showing complete or almost complete fixation with control guinea pig serum) were employed in the tests.

The serums of two guinea pigs inoculated September 25, 1943, and October 2, 1943, respectively, and bled October 15, 1943, were arbitrarily diluted 1:8 and tested October 20, 1943, against two experimental antigens K1 and K2. Of these, K2 was shown to be the better, complete fixation being obtained in dilution 1:2 and partial fixation in dilution 1:4. K1 showed complete fixation when used undiluted. Antigen K2 was therefore employed in testing the serums of four inoculated guinea pigs October 23. Of these, one guinea pig serum, No. 16, showed complete fixation in dilution 1:64 and partial

[1] From the Division of Infectious Diseases, National Institute of Health. This paper was scheduled for publication in Public Health Reports in the issue of February 11, 1944. Because of the subject matter the paper was withheld from publication at that time.

[2] National Institute of Health.

fixation in 1:128. The other three showed slightly less than complete fixation in dilution 1:4. The highest titered serum was used thereafter in the titration of other antigens until the supply was exhausted.

Antigens K1 and K2 had been prepared according to the methods previously employed in the preparation of epidemic typhus antigen. Ten-percent suspensions of infected yolk sac in normal saline containing 1:10,000 merthiolate were prepared in a Waring Blendor. The suspensions were left standing overnight and were then treated with an equal volume of ethyl ether in a separatory funnel. Usually rather good separation was obtained though the aqueous layer was often more or less turbid. A layer, to be referred to as "emulsion," between the lower aqueous layer and the ether layer contained most of the tissue.

Though the aqueous phase was used as antigen in the earlier part of the work, it was found that much of the antigenic substance was contained in the emulsion and that it was more concentrated here, as a rule, than in the aqueous portion. Since the emulsion was not anticomplementary, it was found feasible to use this material as antigen in spite of its turbidity. On standing, a fluid layer usually separated in the lower part of the container, or, if the original material contained more fluid than emulsion, a precipitate formed. However, by mixing, a uniform suspension could easily be obtained. If the emulsion was too concentrated a small amount of the aqueous portion was added. This antigen, though admittedly crude, gave satisfactory results in all tests.[3]

The presence of a considerable portion of the antigenic substance in the emulsion layer might be related to the fact that most of the rickettsiae appear to be embedded in certain yolk-sac material from which they are not easily separated. Lowthwaite (*4*) describes this material as "circumscribed islets of lipoid tissue having the histological appearance of fatty or areolar tissue." The rickettsiae are not often seen in formed cells and are not numerous as free organisms.

A titration of antigen K19 illustrates the distribution of the antigenic substance in the different portions. The aqueous portion of this material showed rather numerous rickettsiae (++). The emulsion, also showing a fair number of rickettsiae, appeared to be in two layers which were taken off separately. The volume of each portion and results of the complement-fixation test are shown in table 1.

In the case of certain other experimental antigens no rickettsiae were visible in the aqueous portion and complement fixation was nega-

[3] See Pub. Health Rep., 60: 1483–1488 (1945), for improved method of preparing antigen.

tive. The reaction of the aqueous portions which were tested varied from pH 7.2 to pH 7.8, no adjustment of the reaction having been made prior to ether treatment. The supernatant fluids of the aqueous portions of two different positive experimental antigens gave negative complement fixation after spinning for 1 hour in the angle centrifuge at 4,000 revolutions per minute.

TABLE 1.—*Distribution of antigenic substance in antigen K19*

	1 1	Dilutions of antigen					
		1 2	1 4	1 8	1 16	1 32	1 64
K19 aqueous (5 cc.)	4	4—	1	0	0	0	---
K19 emulsion 1 (1 cc)			4	4	4	2	1
K19 emulsion 2 (9½ cc)		4	4—	3	Trace	0	0

Attempts were made to free the rickettsiae from the tissue in the emulsion by various means—freezing and thawing, shaking with glass beads, grinding with alundum, and digestion with trypsin. Using the first three methods the emulsion was freed of most of the fluid by centrifugation. After subjection to the various processes, the emulsion was shaken up with a volume of saline equivalent to the amount of fluid that had been removed. The suspension was centrifuged at low speed and the supernatant fluid titrated. No increase in titer was obtained. The precipitate also was titrated, with results similar to those obtained with the untreated emulsion. It was therefore evident that the antigenic substance was still contained in the tissue. Trypsin destroyed the antigenicity, though further investigation of this and other methods is indicated.

As indicated by microscopic examination, rickettsiae were fairly numerous in some of the yolk sacs used for antigen material, but in spite of this no high-titered antigens were obtained as in epidemic and endemic typhus. Titers reached 1:4 or 1:8 in contrast to 1:16 up to 1:64, or occasionally higher with the latter.

Eight other guinea pig serums in addition to those shown, and six human serums have been tested. The guinea pig serums were obtained from animals which had been inoculated with liver-and-spleen emulsions from infected guinea pigs and had had a typical febrile period. Three of the human serums were obtained from recovered cases in New Guinea through the United States of America Typhus Commission and three were procured from the India-Burma border through Lt. Col. M. H. P. Sayers, Assistant Director of Pathology, Fourteenth Army.

Tables 2 and 3 show the results of tests on a number of guinea pig serums. Table 4 shows results with human serums.

TABLE 2.—*Titration of 8 guinea pig serums against Karp antigen K2 (undiluted)*

Guinea pig No.	Days after fever	Dilutions of serums							
		1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512
13	31	4	4	4	4	4−	1	0	0
18	34	4	4	4	4	4	4−	4−	1
19	30	4	4	4	4	4	4	4−	0
22	34	4	4	4	4	4	3	3	1
35	26	4	4	4	4	4	4−	4−	4−
38	20	4	4	4	4−	3	1	1	1
41	22	4	4	4	4−	1	0	0	0
51	9	2	1	1	1	0	0	0	0

The serum from guinea pig 16 obtained 13 days after defervescence was tested against hetrologous antigens as well as the homologous with results shown in table 3.

TABLE 3.—*Titration of guinea pig serum showing results against heterologous antigens*

Antigen	Dilutions of serums							
	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512
Karp	4	4	4	4	4	3	0	
Endemic typhus	0	0	0	0	-------	-------	-------	-------
Epidemic typhus	0	0	0	0	-------	-------	-------	-------
Rocky Mountain spotted fever	0	0	0	0	-------	-------	-------	-------
Q fever	0	0	0	0	-------	-------	-------	-------

Tests for specificity were done with the following heterologous serums:

Epidemic typhus—complement-fixation titer against homologous antigen	1:256
Endemic typhus—complement-fixation titer against homologous antigen	1:512
Rocky Mountain spotted fever—complement-fixation titer against homologous antigen	1:1, 024
Undulant fever—agglutination titer against homologous antigen	1:160
Undulant fever—agglutination titer against homologous antigen	1:1, 280
Tularemia—agglutination titer against homologous antigen	1:5, 120
Tularemia—agglutination titer against homologous antigen	1:1, 280
Typhoid fever—agglutination titer against homologous antigen	1:320
Syphilis—complement-fixation titer (Albany method)	11. 4

No fixation was obtained in any dilution of these serums from 1:4 to 1:32 against the Karp antigen.

TABLE 4.—*Titration of human convalescent serums*

Antigen	Case No.	Day of illness	Dilution of serum 1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512	1:1,024	1:2,048	1:4,906	Weil-Felix OXK
Cases from New Guinea														
Karp K9A	2	26th	4—	2	1	1—	0	0	0	0	---	---	---	1:1,280
Endemic typhus			0	0	0	0	0	0	0	0	---	---	---	
Karp K9A	13	29th	4	4	4	4	4	4	4	4—	---	---	---	1:5,120
Endemic typhus			0	0	0	0	0	0	0	0	---	---	---	
Karp K9A	15	29th	4	4	4	4	2	1	0	0	---	---	---	1:2,560
Endemic typhus			0	0	0	0	0	0	0	0	---	---	---	
Cases from India-Burma border														
Karp K9A	5624329	3d–4th week	4	4	4	4	4	4	4	4—	---	---	---	1:2,560
Epidemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Endemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Rocky Mountain spotted fever			0	0	0	0	---	---	---	---	---	---	---	
Q fever			0	0	0	0	---	---	---	---	---	---	---	
Karp K9A	10870302	3d–4th week	4	4	4	4	4	4	4	4	4	4	1	1:20,480
Epidemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Endemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Rocky Mountain Spotted fever			0	0	0	0	---	---	---	---	---	---	---	
Q fever			0	0	0	0	---	---	---	---	---	---	---	
Karp K9A	2067330	3d–4th week	4	4	4	4	4	4	4—	3	---	---	---	1:20,480
Epidemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Endemic typhus			0	0	0	0	---	---	---	---	---	---	---	
Rocky Mountain spotted fever			0	0	0	0	---	---	---	---	---	---	---	
Q fever			0	0	0	0	---	---	---	---	---	---	---	

SUMMARY

A complement-fixation test for the Karp strain of tsutsugamushi (scrub typhus) has been developed. It appears to be specific as far as tested for the disease, and shows good agreement with the results of the Weil-Felix tests with OXK antigen.

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

April 21–May 18, 1946

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State for each week are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4 weeks ended May 18, 1946, the number reported for the corresponding period in 1945, and the median number for the years 1941–45.

DISEASES ABOVE MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended May 18 there were 1,068 cases of diphtheria reported, as compared with 816 for the corresponding period in 1945 and a 1941–45 median of 780 cases. The incidence was above the preceding 5-year median expectancy in all sections of the country except the East South Central; there the number of cases was slightly below the normal seasonal incidence. For the country as a whole the current incidence was the highest since 1939 when approximately 1,200 cases were reported for the corresponding 4 weeks.

Measles.—The number of reported cases of measles dropped from 153,000 for the preceding 4 weeks to 147,500 during the current 4 weeks. The number was almost 8 times that reported for the corresponding 4 weeks in 1945 and 1.4 times the 1941–45 median. All sections of the country except the East North Central reported an increase over the preceding 5-year median, the numbers of cases ranging from 1.2 times the median in the East South Central section to 3.3 times the median in the Middle Atlantic section. With the exception of the year 1941 when 172,000 cases were reported the current incidence is the highest for this period in the 18 years for which these data are available.

Poliomyelitis.—For the 4 weeks ended May 18 there were 210 cases of this disease reported. The number represents an increase of more than 50 percent over the 1945 figure for this period and is more than twice the 1941–45 median for the corresponding weeks. Of the total number of cases reported, 53 occurred in Florida, 32 in Texas, 24 in California, 15 in New York, and 8 in Louisiana; the remaining cases were widely scattered, and no more than 6 cases were reported from any State. Since the beginning of the year there have been 116 cases of poliomyelitis in the State of Florida, 21 cases and 1 death occurring in Miami, 12 cases and 2 deaths in Tampa, 24 cases in Palm Beach County, with the remaining cases scattered over the State.

DISEASES BELOW MEDIAN PREVALENCE

Influenza.—The number of cases of influenza was relatively low, the current incidence (3,873 cases) being about 70 percent of the 1941–45 median, which is represented by the 1945 figure (5,272 cases). The disease was about normal in the New England and Middle Atlantic sections, but in all other parts of the country the numbers of cases were considerably below the normal seasonal expectancy.

Meningococcus meningitis.—The number of cases (428) of this disease reported for the 4 weeks ended May 18 was the lowest for this period since 1942 when there were 389 cases. The number for the current period was about 60 percent of the 1941–45 median. The comparison with the 1941–45 median is favorable because it included 3 years in which this disease was unusually prevalent, but the incidence is still considerably above the average of normal years (approximately 200 cases).

Scarlet fever.—The scarlet fever incidence was also relatively low, the number of cases (13,617) being about 70 percent of the 1945 figure for this period and 85 percent of the median for the corresponding periods in 1941–45. The South Atlantic and Pacific sections reported a few more cases than might normally be expected, but in all other sections the numbers of cases were comparatively low.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period April 21–May 18, 1946, the number for the corresponding period in 1945, and the median number of cases reported for the corresponding period, 1941–45

Division	Current period	1945	5-year median	Current period	1945	5-year median	Current period	1945	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,068	816	780	3,873	5,272	5,272	147,499	19,081	104,755
New England	48	26	26	9	116	14	13,252	1,369	3,089
Middle Atlantic	173	85	112	44	25	41	49,905	2,229	14,927
East North Central	148	73	117	170	200	301	28,564	2,593	19,422
West North Central	137	93	73	23	59	102	5,337	869	7,512
South Atlantic	187	153	142	1,232	1,207	1,577	12,944	968	7,852
East South Central	52	71	64	117	121	374	2,796	449	2,209
West South Central	148	155	124	1,983	2,868	2,245	9,766	2,267	6,894
Mountain	68	51	51	212	611	476	8,030	1,522	4,324
Pacific	107	109	87	83	65	290	16,905	6,815	7,313
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	428	712	712	210	136	103	13,617	19,001	15,612
New England	25	34	48	5	5	3	1,271	2,023	2,023
Middle Atlantic	104	156	156	18	21	8	4,577	5,262	4,590
East North Central	87	133	133	8	12	8	3,681	4,756	4,189
West North Central	34	49	49	13	6	4	914	1,621	1,153
South Atlantic	54	93	93	66	24	16	1,276	1,692	1,104
East South Central	35	71	71	5	12	12	263	507	507
West South Central	38	68	68	42	45	19	277	480	337
Mountain	4	15	15	24	1	3	470	765	765
Pacific	47	93	93	29	10	12	888	1,895	806
	Smallpox			Typhoid fever, paratyphoid fever			Whooping cough [2]		
United States	41	38	75	249	281	345	8,037	10,548	15,291
New England	0	0	0	7	9	20	965	1,144	1,144
Middle Atlantic	0	0	0	31	38	44	1,703	2,193	2,640
East North Central	16	18	18	26	41	39	1,683	1,316	3,367
West North Central	6	2	9	16	9	14	324	804	475
South Atlantic	2	1	4	48	51	71	1,143	1,629	1,629
East South Central	0	7	9	16	39	40	216	331	641
West South Central	3	5	9	64	68	68	911	1,341	1,341
Mountain	3	4	4	17	10	16	479	523	536
Pacific	11	1	3	24	10	19	613	1,767	1,767

[1] Mississippi and New York excluded; New York City included.
[2] Mississippi excluded.

Smallpox.—Of the total of 41 cases of smallpox reported for the current 4 weeks, 11 occurred in Indiana, 11 in the State of Washington and 5 in Iowa; the remaining cases were widely scattered over the country, no State reporting more than 2 cases. In Washington where an outbreak of this disease occurred during the last week of March, the cases dropped from 19 for that week to 2 for the week ended May 18. In all sections except the Pacific the current incidence either approximated the median or fell below it.

Typhoid and paratyphoid fever.—For the 4 weeks ended May 18 there were 249 cases of these diseases reported, as compared with 281 in 1945 and a 1941–45 median of 345 cases. For the country as a whole the current incidence was the lowest for this period in the 18 years for which these data are available. The situation was

favorable in all sections of the country; 4 sections reported about the normal number of cases and in the other 5 the incidence was relatively low.

Whooping cough.—The number of cases of whooping cough (8,037) was about 75 percent of the number reported for the corresponding weeks in 1945 and 50 percent of the 1941–45 median expectancy. Each section of the country except the East and West North Central reported fewer cases than in 1945, while in all sections the current incidence was lower than the preceding 5-year median figures.

MORTALITY, ALL CAUSES

For the 4 weeks ended May 18 there were 36,467 deaths from all causes reported to the Bureau of the Census by 93 large cities. The average number of deaths for the same weeks in the years 1943–45 was 37,000. The number of deaths was lower in each of the weeks in the current period than the average for the corresponding week in the 3 preceding years.

DEATHS DURING WEEK ENDED MAY 18, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 18, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,901	9,202
Average for 3 prior years	9,047	
Total deaths, first 20 weeks of year	196,267	190,001
Deaths under 1 year of age	611	539
Average for 3 prior years	589	
Deaths under 1 year of age, first 20 weeks of year	12,216	12,470
Data from industrial insurance companies:		
Policies in force	67,170,616	67,314,940
Number of death claims	11,946	13,633
Death claims per 1,000 policies in force, annual rate	9.3	10.6
Death claims per 1,000 policies, first 20 weeks of year, annual rate	10.7	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 25, 1946

Summary

Of the total of 10 cases of smallpox reported during the week, 5 occurred in Indiana, 3 in Colorado, and 1 each in Minnesota and Kansas. The total for the year to date is 214 as compared with 211 for the corresponding period last year, and a 5-year (1941–45) median of 471 (see p. 911).

Of the total of 77 cases of poliomyelitis reported, as compared with 84 last week and 28 for the 5-year median, only 4 States reported more than 2 cases each—Texas 23 (last week 10), Florida 22 (last week 18), California 9 (last week 11), and Louisiana 5 (last week 5). The total to date is 890, as compared with 740 for the period last year and a 5-year median of 499. The total since March 16 (the approximate date of lowest 3-week moving average in each of the years 1944, 1945, and 1946) is 424, as compared with 343 for the same period last year.

The incidence of measles declined during the week in all of the 9 geographic areas except the New England area (increased from 3,257 to 3,890) and the East South Central area (increased from 416 to 559 cases). The current total is 29,444, as compared with 32,317 last week and a 5-year median of 19,116. The total for the year to date is 516,099, as compared with a 5-year median of 422,983.

Of the current total of 277 cases of diphtheria, as compared with 259 last week and a 5-year median of 189, 35 occurred in Texas, 23 in New York, 18 in Maryland, and 16 each in Pennsylvania and California. The cumulative total, 7,206, is 27 per cent above the average for the corresponding periods of the past 6 years. The largest number reported for a corresponding period in those years was 6,849, in 1940.

During the current week, 8,875 deaths were recorded in 93 large cities of the United States, as compared with 8,901 last week, 9,033 and 8,638 for the corresponding weeks, respectively, of 1945 and 1944, and a 3-year (1943–45) average of 8,945. The cumulative number is 205,142, as compared with 199,034 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended May 25, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	May 25, 1946	May 26, 1945		May 25, 1946	May 26, 1945		May 25, 1946	May 26, 1945		May 25, 1946	May 26, 1945	
NEW ENGLAND												
Maine	3	0	0	------	------	------	354	------	81	0	0	1
New Hampshire	0	0	0	------	------	------	37	7	27	0	0	0
Vermont	0	0	0	------	------	------	62	17	88	0	0	0
Massachusetts	4	4	3	------	------	------	2,738	286	968	2	6	6
Rhode Island	0	0	0	------	26	------	106	4	9	0	0	0
Connecticut	1	0	0	------	2	2	593	117	400	2	1	4
MIDDLE ATLANTIC												
New York	23	10	13	[1] 2	[1] 3	[1] 3	3,323	143	776	12	26	26
New Jersey	6	1	2	5	5	2	3,455	64	925	6	11	11
Pennsylvania	16	12	9	2	------	1	3,184	504	1,143	9	9	9
EAST NORTH CENTRAL												
Ohio	12	5	7	3	7	12	745	94	412	8	6	6
Indiana	14	7	5	------	6	6	373	49	162	3	4	2
Illinois	4	7	13	1	1	9	625	299	419	9	23	16
Michigan [2]	5	6	4	1	1	2	926	288	886	4	4	4
Wisconsin	4	3	2	16	24	24	2,471	73	1,644	3	2	1
WEST NORTH CENTRAL												
Minnesota	8	4	3	------	2	------	71	15	476	3	2	2
Iowa	1	2	2	------	------	------	231	76	226	0	3	2
Missouri	3	1	2	5	------	1	113	40	189	3	17	12
North Dakota	1	1	0	5	7	4	13	1	15	0	0	0
South Dakota	1	1	0	------	------	------	44	6	37	1	0	0
Nebraska	1	5	0	------	2	1	480	19	37	0	0	0
Kansas	8	6	4	------	------	1	201	49	287	1	1	0
SOUTH ATLANTIC												
Delaware	1	1	0	------	------	------	21	1	20	0	0	0
Maryland [2]	18	9	6	3	1	1	810	38	290	3	4	5
District of Columbia	0	0	0	------	------	------	219	6	92	1	1	1
Virginia	5	4	4	133	51	59	687	30	186	4	10	9
West Virginia	5	3	3	------	10	4	83	3	51	0	1	0
North Carolina	6	2	3	------	------	3	293	31	557	2	4	4
South Carolina	9	8	5	138	155	155	456	26	141	0	2	2
Georgia	5	1	2	5	6	8	172	13	142	0	1	1
Florida	6	2	1	3	------	1	202	14	168	2	3	3
EAST SOUTH CENTRAL												
Kentucky	6	3	2	------	1	1	111	42	74	6	1	1
Tennessee	1	2	2	5	12	10	148	69	69	3	3	3
Alabama	6	3	5	37	9	17	300	7	105	10	2	2
Mississippi [2]	7	3	3	------	------	------	------	------	------	1	2	3
WEST SOUTH CENTRAL												
Arkansas	3	0	3	8	16	16	175	38	75	0	6	1
Louisiana	0	5	1	1	5	2	64	249	34	0	2	2
Oklahoma	3	2	3	19	20	19	158	26	98	0	0	0
Texas	35	30	17	261	558	398	1,194	457	641	5	9	9
MOUNTAIN												
Montana	0	0	0	------	4	2	93	16	74	0	0	0
Idaho	0	0	0	11	------	------	70	21	21	0	2	0
Wyoming	0	1	0	------	------	------	56	4	82	0	0	0
Colorado	7	9	7	8	17	20	730	20	203	1	0	1
New Mexico	4	0	1	2	------	1	65	9	23	0	0	0
Arizona	15	4	3	24	33	40	161	10	67	0	0	0
Utah [2]	0	0	0	------	4	5	303	226	134	0	0	0
Nevada	0	0	0	------	------	------	1	5	5	0	0	0
PACIFIC												
Washington	3	6	4	------	------	1	278	285	285	2	1	1
Oregon	1	3	2	3	5	5	321	69	135	1	0	0
California	16	13	13	18	10	33	2,107	1,463	1,463	8	13	13
Total	277	189	189	719	1,009	1,009	29,444	5,335	19,116	121	182	182
21 weeks	7,206	5,728	5,590	185,224	62,533	75,305	516,099	69,505	422,983	3,500	4,704	4,704

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended May 25, 1946, and comparison with corresponding week of 1944 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— May 25, 1946	Poliomyelitis: Week ended— May 26, 1945	Poliomyelitis: Median 1941–45	Scarlet fever: Week ended— May 25, 1946	Scarlet fever: Week ended— May 26, 1945	Scarlet fever: Median 1941–45	Smallpox: Week ended— May 25, 1946	Smallpox: Week ended— May 26, 1945	Smallpox: Median 1941–45	Typhoid and paratyphoid fever[2]: Week ended— May 25, 1946	Typhoid and paratyphoid fever[2]: Week ended— May 26, 1945	Typhoid and paratyphoid fever[2]: Median 1941–45
NEW ENGLAND												
Maine	0	0	0	23	40	17	0	0	0	1	0	0
New Hampshire	0	0	0	24	26	7	0	0	0	0	0	0
Vermont	0	0	0	7	10	6	0	0	0	0	0	0
Massachusetts	0	0	0	174	317	286	0	0	0	2	1	2
Rhode Island	0	1	0	12	20	7	0	0	0	0	0	0
Connecticut	0	0	0	37	57	58	0	0	0	2	0	1
MIDDLE ATLANTIC												
New York	0	4	3	494	739	448	0	0	0	2	2	4
New Jersey	1	0	0	142	116	116	0	0	0	0	1	1
Pennsylvania	1	1	1	395	567	384	0	0	0	2	8	8
EAST NORTH CENTRAL												
Ohio	1	3	1	301	332	260	0	1	1	1	1	2
Indiana	0	3	0	52	90	39	5	0	0	1	2	2
Illinois	2	0	0	179	312	269	0	1	1	1	2	3
Michigan[1]	0	0	0	135	325	267	0	0	0	0	0	0
Wisconsin	0	0	0	98	244	241	0	0	1	0	0	0
WEST NORTH CENTRAL												
Minnesota	2	0	0	56	87	52	1	0	0	0	0	0
Iowa	1	0	0	63	34	34	0	0	0	2	0	1
Missouri	0	1	0	23	49	58	0	0	0	3	0	1
North Dakota	0	0	0	3	31	5	0	0	0	0	1	0
South Dakota	0	0	0	9	8	8	0	0	0	0	0	0
Nebraska	0	0	0	24	59	11	0	1	0	0	0	0
Kansas	1	0	1	45	59	51	1	0	0	1	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	2	4	8	0	0	0	0	0	0
Maryland[1]	0	0	0	98	132	53	0	0	0	0	0	3
District of Columbia	0	0	0	12	30	14	0	0	0	0	0	0
Virginia	0	1	1	37	62	25	0	0	0	1	3	3
West Virginia	0	0	0	17	32	32	0	0	0	0	1	1
North Carolina	1	0	0	28	72	15	0	0	0	0	2	2
South Carolina	1	3	0	9	14	5	0	0	0	2	3	3
Georgia	1	1	0	1	23	13	0	0	0	4	2	6
Florida	22	0	1	1	6	3	0	0	0	2	3	3
EAST SOUTH CENTRAL												
Kentucky	0	0	0	33	42	42	0	0	0	0	1	2
Tennessee	0	0	0	25	29	26	0	0	0	3	5	4
Alabama	0	1	1	7	12	9	0	0	0	6	3	3
Mississippi[1]	0	0	0	9	7	2	0	0	1	3	2	2
WEST SOUTH CENTRAL												
Arkansas	1	1	0	1	8	4	0	0	1	3	3	3
Louisiana	5	0	1	0	12	4	0	0	0	3	1	4
Oklahoma	1	0	0	1	20	13	0	1	0	0	1	3
Texas	23	17	4	33	69	43	0	0	0	7	3	7
MOUNTAIN												
Montana	0	0	0	3	10	10	0	0	0	0	1	0
Idaho	0	0	0	7	18	18	0	0	0	1	1	0
Wyoming	0	0	0	2	3	6	0	0	0	0	0	0
Colorado	2	0	0	34	39	29	3	0	0	0	1	0
New Mexico	0	0	0	7	11	7	0	0	0	2	0	0
Arizona	0	0	0	8	48	15	0	0	0	1	1	0
Utah[1]	0	0	0	19	18	20	0	3	0	0	1	0
Nevada	0	0	0	0	1	0	0	0	0	0	0	0
PACIFIC												
Washington	2	3	0	18	51	43	0	0	0	1	1	0
Oregon	0	0	0	39	26	16	0	0	0	3	0	1
California	9	4	4	145	352	129	0	0	0	5	0	4
Total	77	44	28	2,892	4,679	3,218	10	7	19	65	58	100
21 weeks	890	740	499	72,816	112,829	82,498	214	211	471	1,094	1,242	1,603

[1] Period ended earlier than Saturday.
[2] Including paratyphoid fever reported separately, as follows: Massachusetts 1; Connecticut 1; Georgia 2; Florida 1; Louisiana 2; Texas 1; Arizona 1; Oregon 3; California 1.

Telegraphic morbidity reports from State health officers for the week ended May 25, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough, Week ended—May 25, 1946	Whooping cough, Week ended—May 26, 1945	Whooping cough, Median 1941–45	Week ended May 25, 1946: Dysentery, Amebic	Dysentery, Bacillary	Dysentery, Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	3	25	24								1
New Hampshire	3	4	4								
Vermont	14	24	13								1
Massachusetts	108	156	156								1
Rhode Island	25	20	20								1
Connecticut	53	77	66								1
MIDDLE ATLANTIC											
New York	172	210	254	7	6		2				8
New Jersey	112	117	172								1
Pennsylvania	100	221	221		2		1	1			1
EAST NORTH CENTRAL											
Ohio	57	132	132	1							1
Indiana	15	30	32								
Illinois	94	39	100	9			1		1		13
Michigan [3]	108	44	279		1						1
Wisconsin	98	31	111						2		2
WEST NORTH CENTRAL											
Minnesota	5	14	20	5							3
Iowa	27	3	18								4
Missouri	18	16	16			2					
North Dakota	2	4	4								
South Dakota			5								1
Nebraska	5	4	4						1		1
Kansas	15	19	43				1				9
SOUTH ATLANTIC											
Delaware		1	1								
Maryland [3]	17	55	55			1	1	1			
District of Columbia	8	14	14								
Virginia	80	54	80			50		1			1
West Virginia	18	10	21						1		
North Carolina	72	182	182	3	1					1	
South Carolina	64	60	89	1	30				1	2	
Georgia	13	12	35	1	7					12	3
Florida	21	7	24	1						4	
EAST SOUTH CENTRAL											
Kentucky	24	58	58		29						
Tennessee	61	27	65		2			1		1	1
Alabama	12	35	35	2			1			4	
Mississippi [3]									1	1	1
WEST SOUTH CENTRAL											
Arkansas	18	2	32	1	2				11		3
Louisiana	9	7	5							2	
Oklahoma	24	10	13							2	2
Texas	170	250	263	23	377	48	2		2	25	11
MOUNTAIN											
Montana	6	2	4								
Idaho	21	2	3			1					
Wyoming		3	3								
Colorado	23	35	21				1	3			
New Mexico	18	3	10								2
Arizona	41	15	18			45	1				2
Utah [3]	8	43	43								2
Nevada											
PACIFIC											
Washington	35	24	37								
Oregon	46	27	27			1					
California	71	412	378	4	3			2			7
Total	1,914	2,540	3,752	58	460	148	11	9	20	54	85
Same week, 1945	2,540			33	375	117	7	8	14	81	107
Average, 1943–45	2,781			29	392	96	9	[4] 16	15	[4] 48	
21 weeks: 1946	38,940			821	6,714	2,255	177	65	376	963	1,769
1945	52,392			628	8,879	2,404	140	50	331	1,083	1,867
Average, 1943–45	58,429		[4] 80,533	596	6,222	1,665	198	[4] 68	305	[4] 942	

[3] Period ended earlier than Saturday.

[4] 5-year median, 1941–45.

Anthrax: New Jersey 1 case.

Leprosy: Florida 3 cases.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 18, 1946

This table lists the reports from 89 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	------	0	2	0	2	0	0	9
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	1	0	0	0	0	------
Massachusetts:												
Boston	2	0	------	0	337	0	9	0	50	0	0	8
Fall River	0	0	------	0	64	0	0	0	5	0	0	1
Springfield	0	0	------	0	96	0	1	0	8	0	0	1
Worcester	0	0	------	0	405	0	11	0	9	0	0	34
Rhode Island:												
Providence	0	0	------	0	57	0	1	0	4	0	0	21
Connecticut:												
Bridgeport	0	0	------	0	2	0	0	0	1	0	0	------
Hartford	0	0	------	0	11	0	3	0	5	0	0	8
New Haven	0	0	------	0	94	0	2	0	3	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	8	0	------	0	91	0	4	0	17	0	0	8
New York	11	0	6	1	950	3	38	1	309	0	1	42
Rochester	0	0	------	0	192	1	3	0	26	0	0	2
Syracuse	0	0	------	0	11	0	1	0	14	0	0	------
New Jersey:												
Camden	2	0	1	1	25	0	1	0	0	0	0	2
Newark	0	0	------	1	359	0	2	0	12	0	0	30
Trenton	0	0	------	0	80	0	1	0	4	0	0	3
Pennsylvania:												
Philadelphia	3	0	1	0	389	1	19	0	64	0	3	25
Pittsburgh	1	0	------	0	23	3	7	0	28	0	0	1
Reading	2	0	------	0	13	0	3	0	11	0	0	12
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	------	0	32	5	7	0	11	0	0	8
Cleveland	1	0	6	0	145	2	11	0	49	0	2	12
Columbus	2	0	------	0	6	0	3	1	16	0	0	2
Indiana:												
Fort Wayne	0	0	------	0	5	0	3	0	3	0	0	2
Indianapolis	0	0	------	0	119	0	2	0	18	0	0	10
South Bend	0	0	------	0	3	0	0	0	3	0	0	------
Terre Haute	0	0	------	0	13	0	2	0	0	0	0	------
Illinois:												
Chicago	1	0	------	1	218	5	25	0	87	0	1	48
Springfield	0	0	------	0	11	0	2	0	1	0	0	------
Michigan:												
Detroit	1	2	1	1	191	3	4	0	60	0	0	34
Flint	0	0	------	0	9	1	3	0	4	0	0	1
Grand Rapids	0	0	------	0	147	0	0	0	13	0	1	4
Wisconsin:												
Kenosha	0	0	------	0	126	0	0	0	3	0	0	------
Milwaukee	1	0	------	0	978	0	9	0	24	0	0	42
Racine	0	0	------	0	94	0	0	0	6	0	0	------
Superior	0	0	------	0	3	0	0	0	0	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	9	0	1	0	2	0	0	------
Minneapolis	2	0	------	0	21	1	2	1	12	0	0	2
St. Paul	0	0	------	0	9	1	5	0	10	0	0	8
Missouri:												
Kansas City	1	0	------	0	6	0	5	0	8	0	1	5
St. Joseph	0	0	------	0	3	0	0	0	1	0	0	------
St. Louis	0	0	2	0	119	4	9	0	13	0	1	6

City reports for week ended May 18, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	3	0		0	42	1	0	0	5	0	0	1
Kansas:												
Topeka	0	0		0	3	0	2	0	8	0	0	3
Wichita	0	0		0	105	0	2	1	7	0	0	1
SOUTH ATLANTIC												
Delaware:												
Wilmington	1	0		0	12	0	1	0	1	0	1	
Maryland:												
Baltimore	12	1		0	430	0	4	0	26	0	0	6
Cumberland	0	0		0		0	0	0	1	0	0	
Frederick	0	0		0		0	0	0	0	0	0	
District of Columbia:												
Washington	0	0		0	332	1	6	0	14	0	0	13
Virginia:												
Lynchburg	0	0		0	29	0	0	0	0	0	0	
Richmond	0	0		0	95	0	1	0	5	0	0	4
Roanoke	0	0		0	8	0	0	0	3	0	0	
West Virginia:												
Charleston	0	0		0	2	0	0	0	3	0	0	
Wheeling	0	0		0	1	0	1	0	0	0	0	27
North Carolina:												
Raleigh	0	0		0	25	0	4	0	0	0	0	
Wilmington	1	0		0	28	0	0	0	0	0	0	
Winston-Salem	0	0		0	34	0	0	0	4	0	0	11
South Carolina:												
Charleston	0	0	2	0	6	0	1	0	1	0	0	
Georgia:												
Atlanta	0	0		0		0	1	0	0	0	0	
Brunswick	0	0		0		0	0	0	0	0	0	
Savannah	0	0		0	6	0	1	0	0	0	0	
Florida:												
Tampa	1	0	1	1	56	0	0	2	1	0	0	2
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0		1	43	0	6	0	2	0	1	10
Nashville	0	0		0	5	0	2	0	3	0	0	1
Alabama:												
Birmingham	1	0		0	28	0	1	0	2	0	0	1
Mobile	0	0		0	1	0	1	0	1	0	0	
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0		0	23	1	1	0	1	0	0	
Louisiana:												
New Orleans	7	0	6	0	42	0	3	5	6	0	1	1
Shreveport	0	0		0		0	5	0	0	0	0	
Texas:												
Dallas	1	0		0	59	0	1	0	1	0	0	1
Galveston	0	0		0	1	0	1	0	1	0	0	
Houston	0	0	1	0	11	0	3	0	2	0	1	2
San Antonio	2	1		0	21	1	5	6	1	0	0	2
MOUNTAIN												
Montana:												
Billings	0	0		0	4	0	0	0	0	0	0	
Great Falls	0	0		0	4	0	0	0	0	0	0	
Helena	0	0		0	9	0	0	0	0	0	0	
Missoula	0	0		0	18	0	0	0	4	0	0	
Idaho:												
Boise	0	0		0		0	0	0	1	0	0	
Colorado:												
Denver	0	0		0	478	0	9	4	17	0	0	14
Pueblo	0	0		0	44	0	0	0	1	0	0	4
Utah:												
Salt Lake City	0	0		0	90	0	1	0	5	0	0	5

City reports for week ended May 18, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza: Cases	Influenza: Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	1	0		0	51	0	1	0	10	1	0	8
Spokane	0	0		0	24	0	0	0	1	0	0	9
Tacoma	2	0		0	12	1	0	0	2	0	1	7
California:												
Los Angeles	0	0	6	1	285	1	1	1	32	0	1	9
Sacramento	0	0		0	108	0	0	0	0	0	0	3
San Francisco	1	0	2	1	111	0	5	0	17	0	0	
Total	71	4	35	9	8,161	36	273	22	1,114	1	16	538
Corresponding week, 1945	56		29	14	1,593		296		1,525	0	14	575
Average, 1941–45	57		48	[1] 17	[2] 5,605		[1] 376		1,402	1	16	970

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Anthrax.—Cases: Camden 1.
Dysentery, amebic.—Cases: New York, 1; Indianapolis, 1; Chicago, 1; Memphis, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: New Haven, 1; New York, 6; Detroit, 1; Baltimore, 2; Charleston, S. C., 4.
Dysentery, unspecified.—Cases: Baltimore, 1; San Antonio, 29.
Rocky Mountain spotted fever.—Cases: Richmond, 1; Spokane, 1.
Tularemia.—Cases: Birmingham, 1; New Orleans, 1.
Typhus fever, endemic.—Cases: New York, 1; Winston-Salem, 1; Savannah, 1; New Orleans, 1; San Antonio, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 89 cities in the preceding table (estimated population, 1943, 34,366,400)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza: Case rates	Influenza: Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	5.2	0.0	0.0	0.0	2,786	0.0	81.0	0.0	251	0.0	0.0	220
Middle Atlantic	12.5	0.0	3.7	1.4	987	3.7	36.6	0.5	224	0.0	1.9	58
East North Central	3.6	1.2	4.3	1.2	1,277	0.7	43.2	0.6	181	0.0	2.4	99
West North Central	12.1	0.0	4.0	0.0	638	14.1	52.3	4.0	133	0.0	4.0	52
South Atlantic	24.5	1.6	4.9	1.6	1,754	1.6	32.7	3.3	96	0.0	1.6	103
East South Central	5.9	0.0	0.0	5.9	454	0.0	59.0	0.0	47	0.0	5.9	71
West South Central	28.7	2.9	20.1	0.0	451	5.7	54.5	31.0	34	0.0	5.7	17
Mountain	0.0	0.0	0.0	0.0	5,139	0.0	79.4	31.8	222	0.0	0.0	183
Pacific	6.3	0.0	12.7	3.2	935	3.2	11.1	1.6	98	1.6	3.2	57
Total	10.8	0.6	5.3	1.4	1,242	5.5	41.5	3.3	169	0.2	2.4	82

PLAGUE INFECTION IN TEXAS

Under date of May 20, 1946, Dr. N. E. Wayson, of the Office of Plague Suppressive Measures in San Francisco, Calif., reported that plague infection had been found in 8 different pools of fleas taken from ground squirrels, prairie dogs, grasshopper mice, and kangaroo rats in Cochran County, Tex. The specimens were collected during the period April 27–30, 1946.

This is the first report of sylvatic plague in the State, although repeated surveys had previously been made in this district. The specimens were collected over an area of approximately 300 square miles.

In 1920, human cases of plague occurred in Beaumont (14 cases, 6 deaths), Galveston (18 cases, 12 deaths), and Port Arthur (1 fatal case). Intensive plague-suppressive measures soon brought the infection under control, although infected rodents were found in Galveston until 1922. These were the only previously reported instances of plague infection in the State.

Dr. Wayson reports positive findings in pools of fleas as follows: 31 fleas from 26 prairie dogs (*Cynomys* sp.), 12 fleas from 8 ground squirrels (*C. tridecemlineatus*), and 15 fleas from 14 grasshopper mice (*Onychomys* sp.), collected April 27, 5 miles west of a point 5 miles south of Morton on State highway 214; 50 fleas from 31 prairie dogs (*Cynomys* sp.), collected April 27, 5 miles further west; 85 fleas from 30 prairie dogs (*Cynomys* sp.), collected April 30, 10 miles east of a point 10 miles south of Morton on State highway 214; 15 fleas from 17 grasshopper mice (*Onychomys* sp.), 25 fleas from 11 prairie dogs (*Cynomys* sp.), and 6 fleas from 31 kangaroo rats (*Dipodomys* sp.) collected April 30, 5 miles east of a point 20 miles south of Morton on State highway 215.

SMALLPOX IN THE UNITED STATES

No case of smallpox was reported in either California or Washington State during the week. Date of onset of last reported local case in San Francisco was March 27; onset of last case in Seattle was May 9.

During the current week a total of 10 cases of smallpox was reported in the United States, of which 5 occurred in Indiana, where 7 cases were reported during the preceding week (6 in one household; cases of local origin), and 3 in Colorado (2 in the preceding week).

In spite of the outbreak of the disease on the West Coast (61 cases in Washington State, 13 in California), introduced from the Orient, only three more cases have been reported in the United States to date this year than for the same period last year (214 to date this year, 211 for the same period last year).

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 27, 1946.—During the week ended April 27, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		12		105	207	7	21	28	130	510
Diphtheria		7	1	15	3	3			2	31
German measles				35	33		3	3	5	79
Influenza		3			6				4	13
Measles		70	4	628	1,396	18	3	64	17	2,200
Meningitis, meningococcus		1		2	2				2	7
Mumps			1	40	308	71	22	64	196	702
Poliomyelitis					1					1
Scarlet fever		7	2	58	70	8		8	27	180
Tuberculosis (all forms)		1	4	105	60	12	16	29	53	280
Typhoid and paratyphoid fever				11	1		1		6	19
Undulant fever					3				1	4
Venereal diseases:										
Gonorrhea	3	14	12	94	146	65	75	29	75	513
Syphilis	2	16	6	120	76	12	7	5	21	265
Other forms									1	1
Whooping cough		1		47	36	1		15		100

NEW ZEALAND

Notifiable diseases—4 weeks ended February 23, 1946.—During the 4 weeks ended February 23, 1946, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	11	1	Lead poisoning	2	
Diphtheria	76	1	Malaria	7	
Dysentery:			Poliomyelitis	28	
Amebic	6		Puerperal fever	7	1
Bacillary	7		Scarlet fever	90	
Erysipelas	12		Tuberculosis (all forms)	178	57
Food poisoning	117		Typhoid fever	9	1
Influenza	1		Undulant fever	3	

SWEDEN

Vital statistics—1945.—The following are preliminary data for Sweden for 1945: Deaths, all ages, 71,194; infant deaths, 3,963; live births, 133,793. (Population, December 31, 1944—6,597,348; December 31, 1945—6,673,956.)

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

China—Cholera has been reported in China as follows: Hupeh Province, April 1–30, 1946, 111 cases with 25 deaths; Kwangtung Province, April 1–30, 1946, 66 cases with 8 deaths, including 24 cases with 2 deaths in Canton for the period April 21–30, 1946. For the period May 1–10, 1946, 7 cases of cholera were reported in Canton. The following cases in Kiangsi Province were reported to have been imported with Japanese repatriates from Hankow: During the period April 1–10, 1946, 32 cases in Shanghai, and during the period May 1–20, 1946, 47 cases with 3 deaths, in Nanking.

Plague

China—Fukien and Kiangsi Provinces.—For the period April 1–30, 1946, a total of 336 cases of plague, with 131 deaths, was reported in Fukien Province, including 287 cases and 103 deaths in Foochow. During the period February 21–April 20, 1946, 66 cases with 35 deaths were reported in Kiangsi Province.

Smallpox

China—Shanghai.—For the period April 21–30, 1946, 27 cases of smallpox, with 5 deaths, were reported in Shanghai, for the period May 1–10, 52 cases, with 8 deaths, and for the period May 11–20, 32 cases, with 10 deaths.

India—Bombay.—During the week ended April 27, 1946, 125 cases of smallpox, with 25 deaths were reported in the city of Bombay, and 520 cases, with 124 deaths, were reported in the area outside the city of Bombay, within a radius of 400 miles of the city.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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Public Health Reports

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Public Health Reports

Vol. 61 ● JUNE 21, 1946 ● *No. 25*

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INCIDENCE OF POLIOMYELITIS IN THE UNITED STATES IN 1945

By C. C. DAUER, *Epidemiologist, District of Columbia Health Department*

In 1945, 13,514 cases of poliomyelitis were reported in the United States.[1] It was the third successive year of above normal expectancy. The case rates per 100,000 population, as shown in table 1, were 90, 190, and 108 percent higher in 1943, 1944, and 1945, respectively, than the average annual rate for the 5-year period immediately preceding. Death rates were only 33 and 83 percent higher in 1943 and 1944, respectively, than for the same 5-year period. The higher than average number of cases reported per death in 1943 and 1944 in the country as a whole probably resulted from the fact that the disease was epidemic in many States which normally report a relatively high ratio of cases to deaths. On the other hand, in the period from 1938 to 1942, inclusive, extensive outbreaks occurred in a large number of States which report comparatively low ratios.

TABLE 1.—*Number of poliomyelitis cases and deaths, case and death rates per 100,000 population, and number of cases reported per death, in the United States, 1938–45*

Year	Total cases reported	Total deaths registered	Case rate	Death rate	Cases reported per death
1938–42	31,993	4,165	[1] 4.9	[1] 0.6	7.7
1943	12,449	1,115	9.3	.8	11 1
1944	19,029	1,433	14.3	1.1	13.3
1945	13,514		10.2		

[1] Average annual rate.

In 1943 (*1*) the disease was most prevalent in the Pacific States and in the southwestern part of the country, while in 1944 (*2*) the northeastern section experienced widespread epidemics, approximately one-third of the cases occurring in New York State. The distribution in 1945, as shown in the accompanying map (fig. 1) was characterized by a relatively large number of small epidemic areas located in all sections of the country.

[1] All data for 1945 used in this report are provisional. For prior years they are from final reports submitted by States to the U. S. Public Health Service.

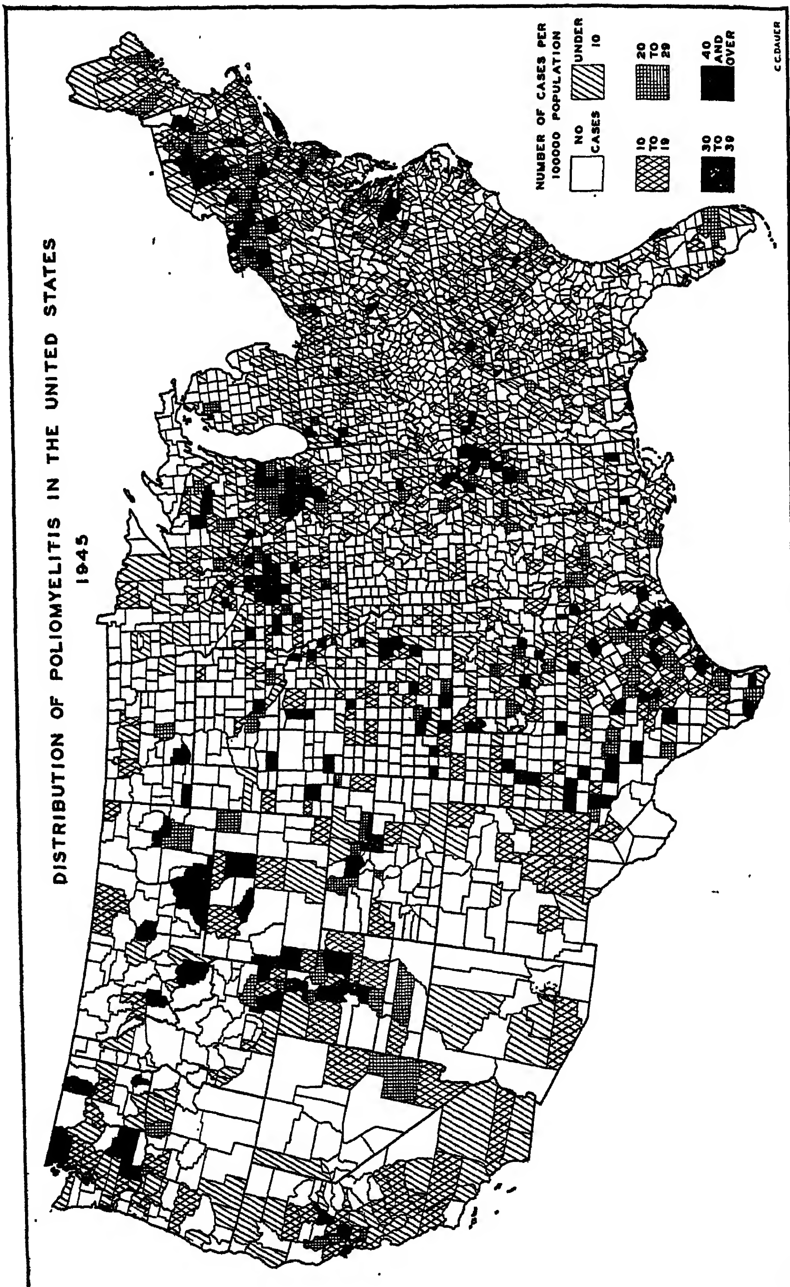
DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1945
NUMBER OF CASES PER 100000 POPULATION
NO CASES
UNDER 10
10 TO 19
20 TO 29
30 TO 39
40 AND OVER
C.C.DAUER

Figure 1.

Further evidence of the widespread distribution of the disease in epidemic form in 1945 is the fact that the median case rate per 100,000 population for the 48 States and the District of Columbia, was relatively high as compared with previous years. For the years from 1940 to 1945, inclusive, the median case rates were 4.3, 4.8, 4.4, 7.6, and 8.3, respectively.

The highest incidence reported by any State in 1945 (see table 2)

TABLE 2.—*Poliomyelitis morbidity rates per 100,000 population and number of cases reported per death, by States, 1940–45*

	Morbidity rates						Cases reported per death 1940–44
	1940	1941	1942	1943	1944	1945	
United States	7.4	6.8	3.2	9.3	11.3	10.2	11.2
New England:							
Maine	1.3	4.8	5.1	1.8	2.7	9.5	8.7
New Hampshire	.4	6.3	2.3	3.1	15.0	6.6	6.5
Vermont	1.7	3.9	9.1	8.8	13.3	19.0	12.4
Massachusetts	1.0	4.2	.9	6.1	10.6	12.9	22.1
Rhode Island	1.2	5.2	.7	27.2	1.8	1.2	15.3
Connecticut	1.1	6.7	2.8	21.6	12.5	12.1	20.9
Middle Atlantic:							
New York	1.6	8.2	2.1	5.4	48.9	14.4	17.8
New Jersey	1.5	8.4	6.1	2.1	13.5	22.6	11.1
Pennsylvania	1.7	7.4	1.2	1.3	15.7	8.1	11.1
East North Central:							
Ohio	9.5	7.0	2.3	2.7	17.1	6.8	11.5
Indiana	19.8	3.4	2.9	3.2	9.9	5.9	8.1
Illinois	7.6	4.8	6.2	20.8	7.4	14.2	10.1
Michigan	23.0	5.1	3.1	3.2	16.4	3.9	15.8
Wisconsin	15.7	3.1	1.4	7.0	9.3	20.5	10.4
West North Central:							
Minnesota	8.4	10.1	2.9	4.4	22.1	9.7	10.3
Iowa	36.9	1.7	2.9	8.9	9.0	14.1	14.1
Missouri	8.3	1.1	2.3	5.9	5.3	8.3	6.9
North Dakota	3.9	2.6	2.8	4.4	9.9	2.9	14.9
South Dakota	12.7	4.3	2.2	2.7	1.5	3.6	11.5
Nebraska	14.0	1.0	10.7	12.2	5.5	10.0	6.2
Kansas	30.1	2.7	6.1	45.3	6.9	7.6	11.1
South Atlantic:							
Delaware	.8	1.0	6.3	2.5	33.9	10.8	16.0
Maryland	.9	13.1	.8	1.2	25.6	5.0	20.0
District of Columbia	1.2	10.1	.6	1.4	21.5	14.8	11.3
Virginia	9.3	5.9	1.8	2.2	27.3	10.9	11.1
West Virginia	34.8	2.5	2.6	1.7	12.8	3.8	9.2
North Carolina	2.1	4.7	2.2	1.1	25.7	4.5	13.0
South Carolina	1.0	8.7	3.5	1.1	3.1	9.9	8.1
Georgia	.9	23.5	1.8	.9	3.5	3.9	15.5
Florida	1.7	14.4	2.2	1.4	5.0	6.0	7.6
East South Central:							
Kentucky	7.8	7.7	4.8	6.1	30.1	2.6	9.2
Tennessee	1.9	18.4	5.3	.6	4.7	15.2	8.7
Alabama	1.9	30.5	2.6	1.4	3.8	5.4	9.3
Mississippi	2.0	6.9	2.7	1.8	6.4	3.8	7.0
West South Central:							
Arkansas	1.5	3.0	7.8	4.4	2.5	3.5	6.5
Louisiana	5.5	2.9	2.4	3.1	6.8	5.3	5.6
Oklahoma	4.9	2.1	.7	30.0	2.7	9.6	9.9
Texas	2.7	2.0	3.8	20.3	3.8	14.7	5.7
Mountain:							
Montana	19.1	5.3	2.7	5.5	8.3	17.7	8.1
Idaho	13.0	1.9	1.1	3.2	3.2	4.8	16.0
Wyoming	16.3	4.7	6.0	13.1	4.2	9.7	7.1
Colorado	3.5	2.5	3.3	27.1	6.0	13.0	7.4
New Mexico	4.3	1.9	5.1	15.7	4.7	4.5	6.8
Arizona	1.4	3.0	6.8	24.0	6.0	3.8	9.1
Utah	11.3	7.4	5.0	68.3	4.2	41.0	16.6
Nevada	1.0	0	2.7	16.0	7.6	6.8	7.2
Pacific:							
Washington	2.4	4.1	1.8	18.4	10.7	15.6	9.6
Oregon	5.8	7.5	2.5	35.2	20.4	5.7	14.0
California	16.6	6.7	5.1	34.2	6.2	10.6	13.3

was Utah where 253 cases were reported to have occurred or 41 per 100,000 population. However, 204 or 80 percent of the total were reported in three counties (Salt Lake, Utah, and Weber) which have nearly two-thirds of the population of the State.

New Jersey reported a relatively high incidence, a total of 949 cases or a rate of 22.6 per 100,000 population. Sixty percent of these occurred in five heavily populated counties located in the extreme northeastern part of the State.

Wisconsin also reported an incidence in excess of 20 cases per 100,000 population but in this State there were two groups of counties with relatively high rates. In the extreme southern part of the State the epidemic area was part of one centering in northern Illinois. In Wisconsin the disease was not reported in unusual numbers until late in August and the prevalence remained at a fairly high level throughout September, October, and November.

In parts of New York State the incidence of poliomyelitis was relatively high in 1945 but the rates were on the average much less than in 1944. Many counties, including Cattaraugus, Schuyler, Sullivan, and Tioga, which had case rates in excess of 200 in 1944, again experienced a higher than average prevalence in 1945. On the other hand, a group of counties in the eastern part of the State in which the disease was only endemic in 1944 reported epidemic prevalence in 1945.

In Virginia the incidence of the disease was high in the western part of the State in 1944 and in the eastern part in 1945. The District of Columbia and contiguous counties in Virginia and Maryland reported higher than average incidence rates in both 1944 and 1945 but the rates were not excessively high in either year. Within the District of Columbia the distribution with respect to areas of high and low prevalence was essentially the same in each year, and with no increase in incidence during the winter months between the two seasons of high prevalence.

Excessively high incidence rates were reported only in a few counties. In Tennessee, Henderson and Chester Counties, which appeared to be the center of an epidemic, reported incidence rates of 274 and 127 per 100,000 population, respectively. Since in Tennessee the reporting of nonparalytic poliomyelitis is not required (*3*) and when reported is not included in the morbidity reports of the State, rates of 274 and 127 would seem to indicate a relatively high rate of incidence.

The adjoining counties of Winnebago and Boone in northern Illinois reported rates of 254 and 236, respectively, and appeared to be the center of an outbreak which included the northern part of Illinois and the southern part of Wisconsin. The percentage of non-

paralytic cases in the two Illinois Counties mentioned is not known. In Iowa several counties in the northern part of the State reported rates in excess of 100 per 100,000 population.

Too much reliance cannot be placed on the actual rates of incidence for any given area as compared with those of other areas because of two factors which affect the number of cases which have been reported. These are the relative completeness of reporting and the inclusion of varying proportions of nonparalytic poliomyelitis in all cases reported by different States, cities, and counties.

Collins (*4*) has recently reported that a name check in the Communicable Disease Study made in 28 large cities in 1936 indicated that only 75 percent of paralytic cases of poliomyelitis were reported to health departments in the large northeastern cities. The disease was epidemic in the northeastern part of the United States one year before the study was made. These data correspond very closely with the findings of Nelson and Aycock (*5*) who found that 77 percent of paralytic cases in Massachusetts were reported to the State Health Department from 1928 to 1941, inclusive. The latter study showed more complete reporting in epidemic periods, and in Collins' report it was indicated that there was less complete reporting (68 percent) in cities located in other geographical sections of the country.

In a previous report (*2*) it was shown that the proportion of paralytic and nonparalytic cases varies widely in different States, cities, and counties. Reports obtained from health departments revealed that some cities included no nonparalytic cases in their totals while some counties and cities had included as many as 80 percent.

These differences in reporting produce wide variations in case-death ratios, whether expressed as the number of cases reported per death or in the form of case fatality rates. In table 3 the total number of cases reported, the total deaths registered, and the number of cases reported per death are tabulated by States for the 5-year period from 1940 to 1944, the States being arranged according to the number of cases reported per death.

It is apparent that the majority of the States in the upper quartile are located in the northeastern part of the country. Three-quarters of those in the lower quartile are located in southern and mountain regions. While there is some evidence of difference in virulence among various strains of poliomyelitis virus in laboratory animals and possibly there are some differences in severity of the disease in different geographical regions, in different groups of individuals or under varying conditions of exposure or routes of infection, these differences do not seem to be of sufficient magnitude to explain the wide variation in the number of cases reported per death. Where there is a wide variation in the number of cases reported per death in adjoining

TABLE 3.—*Number of poliomyelitis cases and deaths reported and number of cases reported per death, by States, 1940–44*

State	Cases per death	Total cases	Total deaths	State	Cases per death	Total cases	Total deaths
Massachusetts	22.1	951	43	Oklahoma	9.9	894	90
Connecticut	20.9	774	37	Washington	9.6	1,113	116
Maryland	20.0	802	40	Alabama	9.3	1,139	122
New York	17.8	8,380	471	Kentucky	9.2	1,501	163
Utah	16.6	515	31	West Virginia	9.2	1,021	111
Delaware	16.0	144	9	Arizona	9.1	236	26
Idaho	16.0	112	7	Maine	8.7	131	15
Michigan	15.8	2,719	172	Tennessee	8.7	909	104
Georgia	15.5	1,009	65	Indiana	8.1	1,338	164
Rhode Island	15.3	261	17	Montana	8.1	219	27
North Dakota	14.9	164	11	South Carolina	8.1	343	42
Iowa	14.1	1,451	103	Florida	7.6	476	62
Oregon	14.0	823	59	Colorado	7.4	458	62
California	13.3	4,083	307	Nevada	7.2	36	5
North Carolina	13.0	1,221	94	Wyoming	7.1	114	16
Vermont	12.4	137	11	Mississippi	7.0	428	61
Ohio	11.5	2,649	230	Missouri	6.9	838	120
South Dakota	11.5	150	13	New Mexico	6.8	163	24
District of Columbia	11.3	295	26	Arkansas	6.5	360	55
Kansas	11.1	1,572	141	New Hampshire	6.5	143	22
New Jersey	11.1	1,296	117	Nebraska	6.2	564	91
Pennsylvania	11.1	2,603	235	Texas	5.7	2,065	362
Virginia	11.1	1,257	113	Louisiana	5.6	498	89
Wisconsin	10.4	1,126	108				
Minnesota	10.3	1,315	127	United States	11.2	53,001	4,728
Illinois	10.1	3,003	296				

States it is even more probable that differences in reporting explain such a variation. For instance, Utah reports 16.6 cases per death while Colorado reports on 7.4 and Vermont reports 12.4 while New Hampshire reports only 6.5, variations which probably are the result of differences in reporting rather than a more severe type of disease in Colorado and New Hampshire as compared with Utah and Vermont.

Part of these differences in reported incidence of poliomyelitis could be corrected if a more uniform system of reporting the disease could be adopted in all the States with reference to nonparalytic and paralytic cases. It is obvious that if such data were available for all States it would be possible to make much more accurate comparisons of incidence and fatality rates by using only paralytic cases as recommended in the most recent edition (6th edition, 1945) of the Control of Communicable Diseases, the official report of the American Public Health Association.

Differences in completeness of reporting of paralytic cases would be much more difficult to correct. Many unreported cases are mild forms of the infection in which paralysis is not always apparent in early stages of the disease and as a consequence such cases are either not recognized or placed under medical care. It has been noted (*4*), (*5*) that unrecognized cases are more common in nonepidemic years and in the outer fringes of an epidemic area.

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PLASMODIUM GALLINACEUM INFECTION CHARACTERIZED BY PREDOMINANCE OF EXO-ERYTHROCYTIC FORMS[1]

By Victor H. Haas, *Senior Surgeon;* Aimee Wilcox, *Associate Protozoologist;* Frances Park Davis, *Medical Technician;* and Frances Moore Ewing, *Medical Technician, United States Public Health Service*

When chicks are inoculated with sporozoites of *Plasmodium gallinaceum,* pigmented forms of the parasite appear in the erythrocytes at the end of the prepatent period, and at the same time nonpigmented (exo-erythrocytic) forms become numerous in certain tissues, particularly the capillaries of the brain and leptomeninges (*1*), (*2*). The studies which form the basis of the present report indicate that under certain reproducible conditions these exo-erythrocytic forms may develop with such rapidity that chicks die of infection either before pigmented forms become detectable, or before they become sufficiently numerous to account for a fatal issue.

Initial appearance of infection characterized by predominance of exo-erythrocytic forms.—On June 12, 1944, several cubic centimeters of citrated chicken blood infected with *P. gallinaceum* were received. This blood was used to inoculate a group of chicks on the following day, and passage from chick to chick by intravenous inoculation of infected blood has been continued ever since. After two serial passages by this method, *Aedes aegypti* were fed on selected chicks, and sporozoite transfers were begun; this type of passage has been continuously employed also.[2]

A number of chicks inoculated with sporozoites from the first mosquito passage failed to develop the parasitemia expected (*1*), (*2*); instead, deaths occurred from the ninth to twentieth days after

[1] From the Office of Malaria Investigations, National Institute of Health, Memphis, Tenn.

[2] The infected blood was kindly furnished by Dr. G. R. Coatney of the National Institute of Health, and was stated by him to be strain 8A, as designated by the Committee on Terminology of Avian Malaria of the American Society of Parasitologists. It was drawn from chicks which had previously been inoculated with infected blood and was received at this laboratory a few hours after being drawn.

Except where otherwise stated, all chicks discussed in this report were inoculated when 2 to 5 days old. The strain of chicks used was obtained from a commercial grower; up to March 1945, White Leghorns were used, but since that time White Rocks have been employed.

inoculation, either without parasites having been found in the blood or with very low parasite counts. These chicks were found to have exo-erythrocytic forms of *P. gallinaceum* in their brains at autopsy. The sample protocols shown in table 1 illustrate the nature of these infections. Infections appeared in chicks bitten by mosquitoes as well as in those inoculated with infected salivary glands, and in chicks which were as young as 2 days and as old as 63 days at the time of inoculation. For convenience of discussion, the type of response seen in these chicks is designated in this report as the "exo-erythrocytic type" of infection, whereas the classical disease is designated as the "erythrocytic type."

TABLE 1.—*Parasitic counts in the peripheral blood of chicks dying with exo-erythrocytic forms of* P. gallinaceum *in their brains following inoculation with sporozoites from the second mosquito passage after departure from the blood passage series (Five chicks from later mosquito passages are included for comparison)*

Identifying number of chick	Parasitized red blood cells per 10,000 erythrocytes on specified days after inoculation										Day of death
	7	8	9	10	11	12	13	14	15	16	
245 [1]	0	0	-----	-----	-----	-----	-----	-----	-----	-----	9
246 [2]	0	0	0	0	0	(1)	0	-----	-----	-----	14
251 [2]	0	0	0	0	0	(4)	0	0	-----	-----	15
253 [2]	0	0	0	0	0	(4)	0	-----	-----	-----	14
261 [2]	0	0	0	0	0	(4)	0	0	-----	-----	15
263 [2]	0	0	0	20	-----	-----	-----	-----	-----	-----	11
269 [1]	0	0	-----	-----	-----	-----	-----	-----	-----	-----	9
295 [1]	0	0	20	-----	-----	-----	-----	-----	-----	-----	10
296 [1]	0	0	10	-----	-----	-----	-----	-----	-----	-----	10
379 [2]	0	0	0	-----	-----	-----	-----	-----	-----	-----	9
601 [3]	0	0	0	-----	1,670	3,000	5,100	-----	-----	-----	15
765	0	10	-----	80	500	1,250	6,300	5,700	5,000	-----	18
784	0	0	0	0	70	-----	2,200	1,530	160	-----	18
901	5	0	0	30	250	640	-----	3,700	-----	-----	16
902	0	20	20	30	200	500	-----	4,400	-----	-----	17

[1] Infection resulted from bites of 2 infected mosquitoes.
[2] Infection resulted from subcutaneous injection of infected salivary glands from 1 mosquito.
[3] Chicks Nos. 601, 705, 784, 901, 902 included here for comparison of parasite counts with those appearing previously in the table. Each was infected by subcutaneous inoculation of the whole salivary glands from 2 infected mosquitoes, infection having been determined by dissection.
[4] Blood smears not examined on day indicated.

The exo-erythrocytic type of infection was seen among chicks during the first and second serial sporozoite passages (chick to mosquito to chick to mosquito, etc.), and among one group after the third passage through mosquitoes. It was present in 46 out of 58 infected chicks examined from these groups, whereas the erythrocytic type of response was observed in only 12 of the chicks.

After the second serial passage through mosquitoes (except for the one group from the third passage mentioned above) the exo-erythrocytic type of infection disappeared almost completely, being seen in only 3 out of 244 infected chicks studied, comprising 14 serial sporozoite passages. All the rest of the regular sporozoite-passage chicks studied presented the erythrocytic type of response.

Spontaneous appearance and intentional reproduction of exo-erythrocytic type of infection in subsequent passages.—On November 27, 1944, mosquitoes were fed on a chick representing the sixteenth serial passage of *P. gallinaceum* by inoculation with infected blood. Salivary glands from these mosquitoes injected into three chicks[3] produced the same exo-erythrocytic type of infection that was seen in the original sporozoite passages. Again on January 13, 1945, mosquitoes were fed on a chick of the blood passage series, this time representing the twenty-first serial passage; two chicks were inoculated with salivary glands from these mosquitoes, and both developed the exo-erythrocytic type of response. On February 1 and on February 23 the same procedure was repeated, the donor chicks representing the twenty-third and twenty-fifth serial passages by blood inoculation; in each case a single chick was subsequently inoculated with infected salivary glands. (Infection of mosquitoes in every case was determined by dissection of the salivary glands in the usual manner.) One died on the tenth day without visible peripheral parasitemia, but with exo-erythrocytic forms in the brain, while the other died on the ninth day with a parasite count of 1,070 parasitized red blood cells per 10,000 erythrocytes, and with exo-erythrocytic forms in the brain (this latter is regarded as the erythrocytic type of response).

These inoculations had been carried out for other purposes, and the striking similarity of the chick responses to those seen in the earlier sporozoite passages was not considered at the time. It was some months later that an analysis of the records indicated that the appearance of the exo-erythrocytic type of infection in chicks tended to occur after the parasite had undergone a series of direct blood inoculation passages from chick to chick, without intervening passage through mosquitoes.

When this tendency became apparent, its validity was tested by feeding more mosquitoes on chicks of the blood passage series. This was done in July 1945, the donor chicks representing the forty-fourth serial blood inoculation passage. These mosquitoes were used to infect 39 chicks: 2 infected mosquitoes were fed on a chick (infection of mosquitoes determined by dissection after biting occurred), and their salivary glands were then inoculated into another chick. (One chick of the original 20 pairs died of bacterial infection and is not included in the analysis.) Every one of the 39 chicks showed the exo-erythrocytic type of response, quite like that seen in the first two series of sporozoite passages, and later observed in the several mosquito passages made from the blood-inoculated series.

[3] Each chick of this entire group received the whole salivary glands from two infected mosquitoes. In order to infect mosquitoes on chicks of the blood passage series, chicks showing gametocyte densities of 1 to 15 per 30 oil immersion fields were selected. Mosquitoes allowed to engorge became infected in proportions varying from one-fourth to approximately one-half of those which engorged.

It is thus clear that the exo-erythrocytic type of response to sporozoite inoculation in chicks appeared with striking regularity after *P. gallinaceum* had been subjected to continuous blood-inoculation passage just prior to being put through the mosquito, and that it occurred only with extreme rarity in chicks infected with parasites subjected to alternating passage through mosquitoes and chicks. The data summarized in table 2 show this contrast clearly.

TABLE 2.—*The occurrence of two types of response in chicks infected with sporozoites of* P. gallinaceum

Origin of sporozoites used to infect chicks	Number of infected chicks examined	Number which developed erythrocytic type of infection	Number which developed exo-erythrocytic type of infection
Regular mosquito passage series	244	241	3
Original mosquito passages made from blood inoculation series	58	12	46
Later sporadic mosquito passages from blood inoculation series	7	1	6
Mosquito passages from blood inoculation series to test hypothesis	39	0	39
Total mosquito passages from blood inoculation series	104	13	91

Comparison of exo-erythrocytic and erythrocytic types of response in chicks.—For comparison of the two types of infection relative to certain details, 100 chicks taken at random from the 254 showing the erythrocytic response, and the entire 94 showing exo-erythrocytic response were studied. The following points indicate the relationship of the two types of infection:

(*a*) Parasitemia occurred in all chicks of the erythrocytic group, by definition. Of the 94 chicks comprising the exo-erythrocytic group, 43 died without parasites having been found in their blood smears, although every one had been subjected to from 1 to 8 examinations before death. The day on which blood examinations were first made varied from the sixth to the ninth, and 20 chicks of the exo-erythrocytic group died before smears were taken, but in none of these were pigmented parasites observed at autopsy, although rare parasites might have been overlooked. The remaining 31 chicks of the group developed the minimal type of parasitemia indicated in (*c*) below.

(*b*) The day of first detectable parasitemia ranged from the sixth to the fifteenth after inoculation in both groups, but the mean in the exo-erythrocytic group, 10.7 days, was a little earlier than that in the erythrocytic group, 12.1 days.

(*c*) Peak parasite counts ranged from 80 to 8,100 parasitized cells per 10,000 erythrocytes in the erythrocytic group, and from 0 to 290 in the exo-erythrocytic group, the mean peak count being 3,464 in the former, and 18 in the latter. Although the ranges of the parasite

counts suggest that there might be an overlapping of the two types of response, the fact is that there was seldom any question about which group a particular chick would fit into, because even though an occasional low peak was encountered in chicks of the erythrocytic group, there would in such cases be a succession of low counts over a period of several days; whereas in the exo-erythrocytic group a count sufficiently high to overlap the lowest range of the erythrocytic group might occur once, but by the next morning the chick would be dead.

(*d*) By definition, all chicks in the exo-erythrocytic group suffered fatal infections. In the erythrocytic group, 64 died during the initial phase of patent infection, 15 were killed within the first 4 weeks after inoculation, and 21 recovered from their initial parasitemia.

(*e*) The day of spontaneous death in the erythrocytic group ranged from the fifteenth to the twenty-fourth day after inoculation, the mean being 17. In the exo-erythrocytic group the range was 7 to 20 days, with a mean of 11. These differences indicate the more rapid development of the exo-erythrocytic type of infection.

It is significant that the mean day of death for the chicks of the exo-erythrocytic group, i. e., the eleventh day, came before the mean day of initial parasitemia, i. e., the twelfth day, in the group characterized by the presence of that feature. This fact suggests that the exo-erythrocytic type of infection represents simply a rapid multiplication of the nonpigmented forms of the parasite to the extent that they cause the death of the chick before an appreciable number of pigmented forms have had time to develop. It may seem at first glance, therefore, that the distinction made herein between the two types of infection is too artificial to merit acceptance; the fact, however, that either type of infection may be produced at will indicates that the difference between the two types of response is a real one.

Production of exo-erythrocytic type of infection in chicks and chick embryos by inoculation with exo-erythrocytic forms.—The chicks of the blood-inoculation series were found to have exo-erythrocytic forms in their brains after the subsidence of the initial parasitemia, in the manner described by James (*3*). By emulsifying such infected brains in physiological saline solution, and inoculating chicks subcutaneously with the suspension, it was possible to produce a type of infection quite similar to that observed in the original sporozoite-inoculated chicks, with few or no parasites visible in blood films, but with exo-erythrocytic forms present in the brain at death. Table 3 illustrates the nature of this infection; the similarity to that of the sporozoite-infected chicks shown in table 1 is evident.

The transfer of this infection serially from chick to chick by inoculation of infected brain emulsion has twice been carried through five consecutive passages, but could not be carried into a sixth series.

TABLE 3.—*Parasite counts in chicks inoculated subcutaneously with saline emulsions of brains infected with exo-erythrocytic forms of* P. gallinaceum; *third serial passage group. Exo-erythrocytic forms present in the brains at autopsy*

Identifying number of chick	Parasitized red blood cells per 10,000 erythrocytes on specified days after inoculation							Day of death
	8	9	10	11	12	13	14	
2851 [1]	0	0	10	--------	--------	--------	--------	11
2852	0	0	0	--------	--------	--------	--------	11
2853	0	0	0	0	--------	--------	--------	12
2854	0	0	0	--------	--------	--------	--------	12
2855	0	0	10	10	--------	--------	--------	12
2856	0	5	20	0	5	--------	--------	12
2857	0	0	0	--------	--------	--------	--------	12
2858	0	0	10	70	--------	--------	--------	12
2859	0	0	0	0	--------	--------	--------	12
2860	0	0	0	0	--------	--------	--------	12

[1] Chicks Nos. 2851–2855 given 0.5 cc. of approximately 1:10 dilution of triturated brain in physiological saline solution; Nos. 2856–2860 given 0.2 cc. of same dilution.

Heavily infected brains taken from moribund or recently dead chicks were infectious in dilutions of approximately 1:100, in doses of 0.2 cc. or more given subcutaneously. The suspension was allowed to stand for one-half hour to permit some settling of the heavier particles, but centrifuging, even at slow speed for only 2 minutes, rendered the supernatant noninfectious. Dilutions of 1:1,000 produced infections in only part of the inoculated chicks, while higher dilutions yielded no evidence of infection. As serial passage progressed, more chicks tended to escape infection, until complete failure supervened in the sixth passage.[4]

Late parasitemia, appearing in the third or fourth week after inoculation, was seen in 10 chicks out of 199 comprising the 5 serial passages. These parasitemias resembled those normally seen in routine sporozoite-induced infections, except for the longer prepatent periods.

In chick embryos, the exo-erythrocytic type of infection was produced by inoculation of chick brains containing these forms into the embryonic yolk. The brains were triturated in the customary way and made up in dilutions of 1:10 and 1:100 in physiological saline solution. From 0.2 to 0.5 cc. of such suspension was inoculated into the yolk of 7- to 9-day-old embryos by the usual technique. As may be seen in table 4, there was considerable mortality within 3 days of inoculation. It is clear, that there is a tendency for this type of response to predominate when embryos are inoculated with exo-erythrocytic forms, and in this respect the reaction of the embryo resembles that seen in the chick infected by the same method.

As in the case of chicks, the exo-erythrocytic forms in the embryo were found most constantly in the brain, although they were seen with

[4] A total of 27 chicks survived a month following inoculation, with no evidence of infection. At the end of a month, each was bitten by 2 infected mosquitoes to determine whether an immunizing inapparent infection might have occurred. No evidence of immunity could be demonstrated.

TABLE 4.—*The reaction of chick embryos inoculated in the yolk with emulsions of chick brain containing exo-erythrocytic forms of* P. gallinaceum

Fate of 506 embryos inoculated into the yolk with brains containing exo-erythrocytic forms	Number of embryos	Number and type of infections developed		
		Exo-erythrocytic type	Erythrocytic type	Type not certain [1]
Embryos survived beyond 3 days	219	34	4	8
Embryos died after 3 days but before hatching	163	25	none	4
Embryos hatched	56	9	4	4

[1] These include embryos which were difficult to classify because of parasite counts between 100 and 1,000 per 10,000 erythrocytes, and those in which bacterial contamination or post-mortem decomposition made autopsy diagnosis unsatisfactory.

considerable frequency in liver and spleen, and occasionally in the yolk sac. Several blood smears revealed the exo-erythrocytic forms in large monocytes. For serial passage, the brain of the embryo was used. The route of passage therefore was: chick brain to embryonic yolk sac; embryonic brain to embryonic yolk sac; etc. Successful passage has been accomplished to the fourth serial passage generation up to the time of this writing.

SUMMARY

1. Certain chicks inoculated with sporozoites of *P. gallinaceum* either by mosquito bites or by injection of salivary glands developed fatal infections either before parasites appeared in their red blood cells or before erythrocytic parasites attained sufficient densities to account for the fatalities. Exo-erythrocytic forms of the parasite were found in the brains of these chicks at autopsy.

2. The exo-erythrocytic type of infection apparently represents a rapid reproduction on the part of the nonpigmented forms of the parasite, to such an extent that they cause the death of the chick before the pigmented forms have time to attain appreciable densities.

3. Responses of this type appeared in 91 out of 104 chicks infected by mosquitoes which had acquired infection by feeding on chicks of the blood-inoculation passage series. They were seen in only 3 chicks out of 244 infected by mosquitoes of the chick-to-mosquito-to-chick passage series.

4. A similar type of infection was produced in chicks by inoculating them subcutaneously with emulsions of brains containing heavy infections with exo-erythrocytic forms, and in chick embryos by inoculating similar material into the yolk. Serial passage of the infection was twice accomplished through five consecutive groups of chicks, but could not be carried farther; passage through four consecutive series of embryos has been accomplished up to the time of writing.

5. There is at present considerable interest in the possibility that some phase of infection comparable to the exo-erythrocytic forms of

P. gallinaceum (and certain other avian Plasmodia) may exist in the mammalian malarias. This report suggests a method for the search for comparable forms in the malarias of mammals.

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PREVALENCE OF TYPHUS COMPLEMENT-FIXING ANTIBODIES IN HUMAN SERUMS IN SAN ANTONIO, TEX.[1]

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INTRODUCTION

Murine typhus fever has attracted attention in recent years because of the great increase in reported cases. In Texas in 1933 only 398 cases were reported to the State Health Department. Since then regular increases have occurred each year: In 1943, 1,452 cases were recorded; and in 1944, 1,740 cases were reported. The increase in reported cases in other southern States has been comparable.

In order to determine the importance of typhus as a public health problem it is desirable to know how many persons have had the disease. It is known that there are many cases that are mild or inapparent, and furthermore that there may be negligence in reporting, or errors in diagnosis. Fortunately, the complement-fixation test makes possible a survey of human or rat bloods to determine the presence of antibodies which indicate past infection by the typhus agent.

To make a survey in San Antonio, arrangements were made with the San Antonio Health Department to obtain the serums from blood specimens which were being collected routinely from food handlers. The complement-fixation tests were run on the serums at the Eighth Service Command laboratories at Fort Sam Houston. Only bloods which were negative for syphilis were used in this survey because of a question of specificity (*1*), (*3*). A total of 4,219 individuals was tested between February and June 1945.

The persons examined in this survey are clearly not a random sample

[1] From the Medical Division, Typhus Control Unit, Malaria Control in War Areas, Atlanta, Ga.

of the population of San Antonio. However, these persons live or work in the area which has the highest rat population and greatest amount of typhus. Therefore it can be said that this survey represents a sample of the persons particularly exposed to infection with typhus fever.

No attempt was made to analyze the data on the basis of occupation because most individuals were changing jobs or had recently changed work. No attempt was made to plot the addresses in the city because the address on the record sheet was often the address of employment and not the home.

METHOD

The technique employed in the complement-fixation test for typhus was essentially that which was described by Bengtson and Topping (*2*). The antigen was prepared from chick embryo yolk sacs infected with the Wilmington strain of murine typhus by emulsifying them with alundum and saline. This was then centrifuged at low speed for 5 minutes and the supernatant fluid was then recentrifuged at 3,200 r. p. m. for 1 hour. The resultant sediment was resuspended and this constituted the antigen.

The test was set up with 1:10 dilution of the unknown serum, 2 units of antigen, and 2 units of complement. After an incubation period of 45 minutes at 37° C., amboceptor and sheep red blood cells were added. The results were read after 30 minutes in the 37° C. water bath. A reaction was considered positive only if it showed 4 fixation.

Positive and negative serum controls, antigen controls, and complement controls always were set up simultaneously.

THE OCCURRENCE OF ANTIBODIES

The results of the survey and the percentages of positive serums are shown in table 1 and a summary is given in table 2. In order to give a rough idea of the population, table 2 presents the 1940 census figures. The population of San Antonio has increased by perhaps 50,000 since 1940. The figures for Latin-Americans (Mexicans) were calculated on the assumption that one-fourth of the whites are Latin-Americans (recommended by the Chamber of Commerce).

Examination of tables 1 and 2 shows that about 1 out of 25 persons has complement-fixing antibodies. The male Latin-Americans showed a higher percentage than the females in the lower age groups, which is perhaps correlated with some sex difference in occupation. The high incidence among Negroes is noteworthy, even though based on a small sample, because few cases among Negroes are reported and the idea that there is a natural racial immunity has been expressed.

TABLE 1.—*Presence of typhus antibodies in human serums negative for syphilis*

Race	Sex	10–19 years			20–29 years			30–39 years			40–49 years			50–59 years			60 and older		
		Total	Positive	Percent	Total	Positive	Percent	Total	Positive	Percent	Total	Positive	Percent	Total	Positive	Percent	Total	Positive	Percent
White	M	160	2	1.2	66	4	6.1	99	3	3.0	143	1	0.7	90	3	3.3	4	0	0
	F	279	13	4.7	386	8	2.1	198	6	3.0	143	4	2.8	58	0	0	1	1	100
Latin-American	M	341	15	4.4	155	9	6.2	187	13	6.9	139	7	5.0	95	2	2.1	3	0	0
	F	453	12	2.7	405	14	3.6	246	9	3.7	162	6	3.7	72	2	3.9	2	0	0
																	0	0	-------
Negro	M	39	0	0	24	2	8.3	19	1	5.6	23	1	4.6	9	1	11.1			
	F	37	1	2.7	77	2	2.6	60	3	5.0	30	3	10.0	14	0	0	0	0	-------

TABLE 2.—*Summary of presence of antibodies for murine typhus fever*

	1940 population		Serums tested		
	Sex	Number	Totals	Number positive	Percent positive
White	Male	91,722	562	13	2.3
	Female	93,879	1,065	32	3.0
Totals			1,627	45	2.8
Latin-American	Male	30,721	920	46	5.0
	Female	31,390	1,340	43	3.2
Totals			2,260	89	3.9
Negro	Male	8,114	114	5	4.3
	Female	10,190	218	9	4.1
Totals			332	14	4.2
Grand totals		266,116	4,219	148	3.5

The rates are not calculated because the serums are not a sample of the total population and because the population has changed so much since the 1940 census. In spite of the fact that rates cannot be calculated, this survey accomplished its aim of demonstrating the large number of typhus fever infections. The survey shows that 3.5 percent of persons tested have complement-fixing antibodies. It must be remembered that these results are the accumulation of an indefinite number of infections over a period of years, as the complement-fixation test remains positive for many years. If we assume that all these infections occurred in the last 10 years, and that the sample comes from a population of 200,000 persons (both assumptions being reasonable and conservative) then roughly 700 persons became infected each year. In contrast, the San Antonio Health Department recorded only 5 cases in 1941, only 16 cases in 1942, only 32 cases in 1943, and only 91 cases in 1944. Hence this survey shows that many more persons become infected than are reported as cases of typhus fever.

SUMMARY AND CONCLUSIONS

A survey of food handlers in San Antonio, Tex., showed that 3.5 percent of 4,219 persons had complement-fixing antibodies to murine typhus fever.

When compared with the number of cases reported, the high incidence of antibodies indicates that many infections are not reported as typhus fever and may be subclinical.

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DEATHS DURING WEEK ENDED MAY 25, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 25, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,875	9,033
Average for 3 prior years	8,945	
Total deaths, first 21 weeks of year	205,112	199,034
Deaths under 1 year of age	638	572
Average for 3 prior years	607	
Deaths under 1 year of age, first 21 weeks of year	12,586	13,012
Data from industrial insurance companies:		
Policies in force	67,185,911	67,333,313
Number of death claims	11,564	13,902
Death claims per 1,000 policies in force, annual rate	9.0	10.8
Death claims per 1,000 policies, first 21 weeks of year, annual rate	10.6	11.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 1, 1946

Summary

A total of 145 cases of poliomyelitis was reported for the current week, as compared with 77 for the preceding week, bringing the total to date to 1,035 as compared with 811 for the corresponding period in 1945, 545 in 1944, and 599 in 1943. Of the current total, 94 cases, or 65 percent, were reported in four States, as follows (last week's figures in parentheses): Florida, 31 (22); Texas, 26 (23); Alabama, 26 (0); and California, 11 (9). No other State reported more than 6 cases. Of the total cases to date this year (last year's figures in parentheses), Florida has reported 169 (25), California 150 (59), Texas 122 (119), New York State 72 (154), Washington State 48 (28), Louisiana 39 (8), and Alabama 35 (37).

Of 18 cases of smallpox reported during the current week, 7 cases, with 1 death, occurred in Washington State (6 in Port Angeles, a new focus reported during the week of May 18). (See p. 940.)

The incidence of measles is declining slowly, but a total of 542,446 cases has been reported to date, as compared with 537,630 for the same period in 1944, and 723,249 in 1941, the recent prior years of highest reported incidence. Only 74,099 cases had been reported for the corresponding period of 1945.

Diphtheria continues above the median expectancy and recent prior years. Currently, 290 cases were reported, as compared with 277 last week, 211 for the same week in 1945, and a 5-year (1941–45) median of 174. The total reported to date is 7,496, as compared with 5,937 for the same period last year, and a 5-year median of 5,743 cases for the corresponding period.

A total of 8,272 deaths was reported in 93 large cities in the United States, as compared with 8,878 for the preceding week and a 3-year average of 8,708. To date 213,417 deaths have been reported in these cities as compared with 207,714 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended June 1, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945	
NEW ENGLAND												
Maine	3	0	0	1	------	------	185	3	95	0	0	2
New Hampshire	0	0	0	------	------	------	54	------	27	1	0	2
Vermont	0	0	0	------	------	------	121	18	88	0	0	0
Massachusetts	4	2	4	------	------	------	2,266	246	810	3	5	5
Rhode Island	0	0	0	------	4	------	140	9	39	1	1	1
Connecticut	5	0	0	------	1	1	602	74	345	3	6	3
MIDDLE ATLANTIC												
New York	30	16	9	(1)	[1] 4	[1] 4	3,636	118	1,144	8	10	18
New Jersey	2	3	3	3	1	1	2,388	51	724	4	9	6
Pennsylvania	14	9	9	------	------	------	2,211	621	949	6	14	17
EAST NORTH CENTRAL												
Ohio	12	4	4	1	2	6	973	73	320	2	7	7
Indiana	9	16	7	1	6	6	430	52	162	1	2	2
Illinois	8	4	10	2	2	5	677	337	396	6	16	16
Michigan [2]	9	20	6	------	1	1	845	283	503	3	11	9
Wisconsin	1	1	1	22	32	22	2,493	119	1,582	2	1	1
WEST NORTH CENTRAL												
Minnesota	15	2	2	------	2	1	83	20	275	5	0	0
Iowa	10	2	3	------	------	------	500	49	115	2	1	1
Missouri	2	7	2	2	2	------	171	28	172	1	7	7
North Dakota	0	0	0	------	3	1	8	3	15	1	1	0
South Dakota	5	0	0	------	------	------	28	9	13	0	0	0
Nebraska	1	1	2	1	4	2	134	16	149	0	4	1
Kansas	13	10	4	------	1	2	117	47	219	1	0	2
SOUTH ATLANTIC												
Delaware	0	1	0	------	------	------	17	4	6	0	2	1
Maryland [2]	12	6	5	------	------	------	596	33	193	2	0	1
District of Columbia	0	0	0	------	------	------	168	6	88	0	3	1
Virginia	8	2	5	72	88	88	708	25	364	2	7	7
West Virginia	3	1	1	6	------	2	63	42	108	2	0	2
North Carolina	11	19	10	------	------	------	338	46	439	5	2	2
South Carolina	1	2	3	123	119	154	325	24	105	0	0	1
Georgia	3	5	2	5	145	12	143	22	96	1	0	0
Florida	6	1	2	------	------	------	135	7	124	5	4	2
EAST SOUTH CENTRAL												
Kentucky	6	2	2	------	1	------	89	30	88	0	7	5
Tennessee	2	3	2	15	21	10	104	12	120	1	4	4
Alabama	2	2	2	8	13	31	145	3	116	3	5	4
Mississippi [2]	7	3	3	------	------	------	------	------	------	2	1	1
WEST SOUTH CENTRAL												
Arkansas	8	2	2	9	5	7	82	38	77	2	1	1
Louisiana	6	2	2	5	------	1	104	12	31	2	7	3
Oklahoma	3	4	2	11	31	28	146	29	57	2	6	1
Texas	29	25	17	313	482	403	1,575	345	423	13	12	3
MOUNTAIN												
Montana	0	1	0	1	19	4	188	7	70	1	1	0
Idaho	0	0	0	20	------	------	48	9	29	0	1	0
Wyoming	0	0	0	------	------	------	36	11	32	0	0	0
Colorado	13	3	6	3	14	31	478	13	336	0	0	0
New Mexico	1	2	1	3	5	------	54	7	44	0	0	0
Arizona	1	0	0	18	54	44	158	21	48	0	2	1
Utah [2]	0	0	0	------	18	2	213	160	94	0	0	0
Nevada	0	0	0	------	------	------	13	1	13	0	0	0
PACIFIC												
Washington	7	9	1	------	------	1	262	137	137	8	2	2
Oregon	0	2	1	------	5	7	214	60	102	0	0	0
California	18	17	13	10	10	33	1,883	1,308	1,308	7	11	11
Total	290	211	174	655	1,095	1,026	26,347	4,594	16,646	108	173	173
22 weeks	7,496	5,937	5,743	185,879	63,628	76,059	542,446	74,099	444,654	3,608	4,877	4,877

[1] New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended June 1, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45	Week ended—		Median 1941-45
	June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945		June 1, 1946	June 2, 1945	
NEW ENGLAND												
Maine	1	0	0	27	52	24	0	0	0	1	1	0
New Hampshire	0	0	0	11	6	6	0	0	0	0	0	0
Vermont	0	0	0	4	16	14	0	0	0	0	0	0
Massachusetts	0	0	0	174	255	244	0	0	0	3	0	2
Rhode Island	0	0	0	1	13	9	0	0	0	0	0	0
Connecticut	0	0	0	28	58	56	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York	4	3	1	381	543	389	0	0	0	2	3	5
New Jersey	0	4	0	98	109	109	0	0	0	1	0	0
Pennsylvania	1	3	0	230	442	285	0	0	0	2	3	3
EAST NORTH CENTRAL												
Ohio	1	0	0	296	300	232	0	0	0	2	2	1
Indiana	1	1	0	55	75	75	3	0	0	2	3	2
Illinois	5	1	1	155	232	179	1	0	1	1	2	2
Michigan [2]	1	0	0	139	254	182	0	0	0	2	0	0
Wisconsin	0	0	0	81	251	253	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	2	0	0	53	77	51	0	0	0	1	0	0
Iowa	3	0	0	42	26	26	0	0	0	0	0	1
Missouri	0	0	0	26	70	70	1	2	1	4	4	4
North Dakota	0	0	0	7	15	5	0	0	0	1	0	0
South Dakota	0	0	0	12	11	12	0	3	0	0	0	0
Nebraska	0	0	0	12	48	22	0	0	0	0	0	0
Kansas	1	0	0	33	53	42	1	1	0	0	1	0
SOUTH ATLANTIC												
Delaware	1	0	0	2	1	4	0	0	0	0	0	0
Maryland [2]	0	0	0	39	115	73	0	0	0	0	1	2
District of Columbia	0	0	0	8	25	11	0	0	0	0	0	0
Virginia	0	5	0	77	55	20	0	0	0	1	1	1
West Virginia	0	1	0	16	33	20	0	0	0	1	0	1
North Carolina	5	4	0	21	74	16	0	0	0	0	2	2
South Carolina	1	4	0	4	12	6	0	0	0	7	0	2
Georgia	0	5	0	10	30	12	1	1	0	3	10	9
Florida	31	0	3	0	3	3	0	0	0	1	2	3
EAST SOUTH CENTRAL												
Kentucky	1	1	1	16	21	27	0	0	0	0	1	1
Tennessee	0	0	0	13	11	27	0	0	0	6	3	2
Alabama	26	3	2	10	9	9	0	0	0	1	13	2
Mississippi [2]	5	1	1	2	6	3	0	0	0	2	4	3
WEST SOUTH CENTRAL												
Arkansas	1	1	1	12	5	4	0	0	0	4	2	2
Louisiana	3	0	0	13	8	5	0	0	0	10	5	7
Oklahoma	3	1	0	10	13	11	0	0	0	0	0	1
Texas	26	24	3	15	56	35	1	0	0	13	6	10
MOUNTAIN												
Montana	2	0	0	5	15	11	0	0	0	0	0	0
Idaho	0	0	0	16	15	15	1	0	0	3	0	0
Wyoming	0	0	0	1	6	11	0	0	0	0	0	0
Colorado	6	0	0	35	36	36	0	0	0	1	2	2
New Mexico	0	0	0	4	4	2	0	0	0	0	0	0
Arizona	0	0	0	11	24	6	0	0	0	1	2	0
Utah [2]	2	5	0	22	9	9	0	0	0	0	0	0
Nevada	0	0	0	3	0	0	2	0	0	0	0	0
PACIFIC												
Washington	1	1	0	21	56	22	7	0	0	2	2	1
Oregon	0	0	0	27	22	14	0	0	0	1	0	1
California	11	3	5	147	313	138	0	0	0	6	4	4
Total	145	71	46	2,458	3,889	2,844	18	7	8	86	79	83
22 weeks	1,035	811	545	75,274	116,718	85,342	232	218	507	1,180	1,321	1,686

[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever reported separately, as follows: Massachusetts 2; Connecticut 1; New York 1; Minnesota 1; South Carolina 1; Georgia 2; California 6.

Telegraphic morbidity reports from State health officers for the week ended June 1, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough			Week ended June 1, 1946							
	Week ended—		Median, 1941–45	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	June 1, 1946	June 2, 1945		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	13	68	25								
New Hampshire	4		3								
Vermont	1	13	15								
Massachusetts	124	114	114		4						2
Rhode Island	9	22	19								
Connecticut	49	35	35	1			1				2
MIDDLE ATLANTIC											
New York	131	192	215	3							8
New Jersey	88	82	82	2				1			1
Pennsylvania	180	137	233					2			2
EAST NORTH CENTRAL											
Ohio	87	91	131			1					2
Indiana	30	9	47								2
Illinois	103	76	101	7			5	1			8
Michigan [3]	125	60	130		2						4
Wisconsin	127	38	113						1		11
WEST NORTH CENTRAL											
Minnesota	22	3	31	1					1		3
Iowa	27	3	16	1							
Missouri	19	11	26								1
North Dakota		1	5								
South Dakota		3	4								
Nebraska	7		14								
Kansas	11	32	63								9
SOUTH ATLANTIC											
Delaware											
Maryland [3]	7	83	83			1		1			1
District of Columbia	10	11	11								
Virginia	133	38	64	1		56		7	5		1
West Virginia	30	4	41								
North Carolina	109	194	194		1			3		1	
South Carolina	31	71	76		19						
Georgia	4	37	37		9			1		7	2
Florida	45	17	21	1	1					3	
EAST SOUTH CENTRAL											
Kentucky	25	34	56				1		1		
Tennessee	45	6	48		1		1	1	4	1	
Alabama	31	15	44	1			1			8	1
Mississippi [3]										1	
WEST SOUTH CENTRAL											
Arkansas	2	12	17	1	2					2	4
Louisiana	5	2	2	4						4	2
Oklahoma	7	11	15					2			1
Texas	172	330	297	8	155	124	6			25	17
MOUNTAIN											
Montana	5	1	12						1		
Idaho	21	4	8								
Wyoming	20	1	3					1	1		
Colorado	12	26	43		1			3			
New Mexico	13	8	5	2	1						
Arizona	24	15	18	1		66					
Utah [3]	7	21	47						2		
Nevada											
PACIFIC											
Washington	43	15	23								1
Oregon	25	17	17								
California	96	403	365	3	2		1				6
Total	2,079	2,306	3,765	37	498	248	16	23	16	52	91
Same week, 1945	2,366			53	483	114	9	24	20	90	100
Average, 1943–45	2,752			44	436	102	13	[4] 23	20	[4] 50	
22 weeks: 1946	41,019			858	7,212	2,503	193	88	392	1,015	1,860
1945	54,758			681	9,362	2,518	149	75	351	1,173	1,967
Average, 1943–45	61,181		[4] 84,303	640	6,659	1,767	211	[4] 84	325	[4] 999	

[3] Period ended earlier than Saturday.

[4] 5-year median, 1941–45.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 25, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	39	0	2	0	1	0	1	------
New Hampshire:												
Concord	0	0	------	0	3	0	0	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	1	0	2	0	0	0	0	------
Massachusetts:												
Boston	1	0	------	0	305	2	7	0	36	0	0	10
Fall River	0	0	------	0	124	0	1	0	4	0	0	------
Springfield	0	0	------	0	156	0	0	0	4	0	1	2
Worcester	0	0	------	0	421	0	4	0	1	0	0	41
Rhode Island:												
Providence	0	0	------	0	99	0	0	0	8	0	0	25
Connecticut:												
Bridgeport	0	0	------	0	1	0	0	0	2	0	0	------
Hartford	0	0	------	0	7	0	1	0	2	0	0	3
New Haven	0	0	------	0	143	0	1	0	1	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	6	0	------	0	56	0	3	0	7	0	0	6
New York	11	1	2	3	1,017	10	59	0	250	0	1	44
Rochester	0	0	------	0	163	0	2	1	34	0	0	------
Syracuse	0	0	------	0	13	0	3	0	12	0	1	2
New Jersey:												
Camden	1	0	------	0	14	0	1	0	4	0	0	------
Newark	0	0	------	0	288	3	4	0	11	0	0	17
Trenton	1	0	------	0	100	0	0	0	5	0	1	3
Pennsylvania:												
Philadelphia	2	0	2	0	343	4	19	0	50	0	2	12
Pittsburgh	0	0	1	2	33	1	6	0	20	0	0	7
Reading	0	0	------	0	12	0	0	0	6	0	0	7
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	3	0	------	0	97	1	6	0	6	0	0	6
Cleveland	0	0	------	0	176	1	5	0	38	0	1	11
Columbus	0	0	------	0	15	0	2	0	11	0	0	6
Indiana:												
Fort Wayne	0	0	------	0	10	0	0	0	2	0	0	------
Indianapolis	3	0	------	0	104	2	5	0	9	0	0	7
South Bend	0	0	------	0	1	0	0	0	2	0	0	------
Terre Haute	0	0	------	0	22	0	0	0	1	0	0	------
Illinois:												
Chicago	0	0	1	0	172	3	25	0	113	0	0	41
Springfield	0	0	------	0	11	2	0	0	1	0	0	------
Michigan:												
Detroit	5	1	------	1	157	1	13	0	53	0	0	60
Flint	0	0	------	0	9	0	0	0	10	0	0	------
Grand Rapids	0	0	------	0	174	0	1	0	9	0	0	13
Wisconsin:												
Kenosha	0	0	------	0	195	0	0	0	2	0	0	------
Milwaukee	0	0	1	1	901	0	1	0	21	0	0	42
Racine	0	0	------	0	118	0	0	0	1	0	0	------
Superior	0	0	------	0	------	0	3	0	1	0	0	2
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	18	0	2	1	3	0	0	------
Minneapolis	2	0	------	0	17	1	5	1	26	0	0	2
Missouri:												
Kansas City	1	0	1	0	3	1	5	0	5	0	0	5
St. Joseph	0	0	------	0	1	0	0	0	4	0	1	------
St. Louis	1	0	4	1	99	1	6	0	4	0	1	5

City reports for week ended May 25, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo	0	0	------	0	3	0	0	0	0	0	0	------
Nebraska:												
Omaha	0	0	------	0	41	0	1	0	1	0	0	1
Kansas:												
Topeka	0	0	------	0	------	0	3	0	5	0	0	3
Wichita	0	0	------	0	45	1	3	1	5	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	11	0	2	0	0	0	0	------
Maryland:												
Baltimore	17	0	2	2	570	3	15	0	21	0	0	12
Cumberland	0	0	------	0	------	0	1	0	2	0	0	------
Frederick	0	0	------	0	------	0	0	0	1	0	0	------
District of Columbia:												
Washington	0	0	------	0	219	1	2	0	12	0	0	8
Virginia:												
Lynchburg	0	0	------	0	27	0	0	0	1	0	0	------
Richmond	0	0	------	0	106	2	3	1	3	0	1	3
Roanoke	0	0	------	0	38	0	1	0	1	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	1	0	0	------
Wheeling	1	0	------	0	2	0	1	0	0	0	0	14
North Carolina:												
Raleigh	1	0	------	0	16	0	0	0	1	0	0	1
Winston-Salem	0	0	------	0	12	0	0	0	4	0	0	13
South Carolina:												
Charleston	0	0	------	0	2	0	1	0	2	0	0	3
Georgia:												
Atlanta	0	0	------	0	38	0	3	0	0	0	0	------
Brunswick	0	0	------	0	1	0	1	0	0	0	0	------
Savannah	0	0	------	0	8	0	1	0	0	0	0	------
Florida:												
Tampa	2	0	------	0	35	0	1	3	1	0	0	1
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	1	25	0	9	0	3	0	0	4
Nashville	0	0	------	1	1	0	2	0	2	0	0	6
Alabama:												
Birmingham	0	0	2	0	11	0	1	0	1	0	0	------
Mobile	0	0	1	0	4	1	1	0	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	1	0	------	0	24	0	0	0	1	0	0	------
Louisiana:												
New Orleans	2	0	1	0	22	0	2	5	2	0	1	------
Shreveport	0	0	------	0	------	1	4	0	0	0	2	------
Texas:												
Dallas	3	1	------	0	42	0	1	0	8	0	0	4
Galveston	1	0	------	0	5	0	0	0	1	0	0	------
Houston	3	0	------	0	5	0	2	0	1	0	1	------
San Antonio	1	0	------	0	21	0	7	11	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	2	0	0	0	0	0	0	------
Great Falls	0	0	------	0	17	0	2	0	1	0	0	------
Helena	0	0	------	0	4	0	0	0	0	0	0	------
Missoula	0	0	------	0	14	0	0	0	0	0	0	------
Idaho:												
Boise	0	0	------	0	------	0	0	0	0	0	0	2
Colorado:												
Denver	5	1	2	0	443	1	4	2	7	0	0	18
Pueblo	1	0	------	0	41	0	0	0	6	0	0	------
Utah:												
Salt Lake City	0	0	------	0	116	0	2	0	6	0	0	1

City reports for week ended May 25, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0		0	36	0	1	0	13	0	0	7
Spokane	0	0		0	8	0	1	0	0	0	0	6
Takoma	0	0		0	2	0	0	0	0	0	0	11
California:												
Los Angeles	1	0	6	0	333	0	2	2	44	0	0	9
San Francisco	2	0		0	104	1	3	0	14	0	0	2
Total	78	4	26	12	8,092	44	277	28	952	0	15	511
Corresponding week, 1945	51		22	5	1,772		314		1,519	0	10	695
Average, 1941-45	55		44	[1] 16	[2] 5,194		[1] 322		1,273	1	17	937

[1] 3-year average, 1943-45.
[2] 5-year median, 1941-45.

Anthrax.—Cases: Philadelphia, 1.
Dysentery, amebic.—Cases: New York, 4; Newark, 2; Chicago, 1; Kansas City, 1; St. Louis, 1; Los Angeles, 3.
Dysentery, bacillary.—Cases: New York, 4; Syracuse, 2; Philadelphia, 2; Baltimore, 1; Charleston, S. C., 4; Memphis, 1.
Dysentery, unspecified.—Cases: San Antonio, 19.
Typhus fever, endemic.—Cases: Houston, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 33,949,100)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles, case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	2.6	0.0	0 0	0.0	3,395	5.2	47.1	0.0	154	0.0	5.2	212
Middle Atlantic	9.7	0.5	2.3	2.3	944	8.3	44.9	0.5	185	0.0	2.3	45
East North Central	6.7	0.6	1.2	1.2	1,315	6.1	37.1	0 0	170	0.0	0.6	114
West North Central	8.9	0 0	11.1	2.2	505	8.9	55.7	6.7	118	0.0	4.5	40
South Atlantic	34.9	0.0	3.3	3.3	1,801	10.0	53.1	6.6	83	0.0	1.7	91
East South Central	0.0	0.0	17.7	11.8	242	5.9	76.7	0.0	35	0.0	0.0	59
West South Central	31.6	2.9	2.9	0.0	341	2.9	45.9	45.9	40	0.0	11.5	14
Mountain	47.7	7.9	15.9	0.0	5,059	7.9	63.5	15.9	159	0.0	0.0	167
Pacific	4.9	0.0	9.8	0.0	792	1.6	11.5	3.3	116	0.0	0.0	57
Total	12.0	0.6	4.0	1.8	1,246	6.8	42.7	4.3	147	0.0	2.3	79

PLAGUE INFECTION IN VENTURA COUNTY, CALIF.

Plague infection has been reported demonstrated, on May 20, 1946, in rodents and fleas from rodents in Ventura County, Calif., as follows: In tissue from 1 rat found dead and from 2 rats trapped on April 9; in tissue from 3 rats trapped on April 11; in 30 fleas from 14 rats trapped on April 9; in 6 fleas from 1 rat found dead on April 8 (all *Rattus rattus*); in 28 fleas from 3 mice *(Peromyscus maniculatus)* trapped on April 12; in bone marrow from 1 ground squirrel (*Citellus*

beecheyi) found dead April 12—all on the Conterno Ranch, 2 miles east of Santa Paula; in tissue from 1 ground squirrel (*C. beecheyi*) trapped on April 11, on the Newport Ranch, 1½ miles south and 1 mile east of Santa Paula.

SMALLPOX IN THE UNITED STATES

During the week ended June 1, 7 cases of smallpox, with 1 death, were reported in Washington State—6 cases with 1 death in Port Angeles, Clallam County, and 1 case in Republic, Ferry County, the latter with onset on May 1, not related to the cases in the Seattle area. The total for the State to date is 68 cases and 20 deaths. Onset of last case, May 24, in Port Angeles.

During the current week, 11 cases were reported in other States—3 in Indiana, 2 in Nevada, and 1 each in Illinois, Missouri, Kansas, Georgia, Texas, and Idaho.

A total of 232 cases has been reported in the United States to date this year as compared with 218 for the same period last year and a 5-year (1941–45) median of 507 for the period.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 4, 1946.—During the week ended May 4, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Bruns-wick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Al-berta	British Colum-bia	Total
Chickenpox		15		155	256	12	28	18	84	568
Diphtheria		2		35		1	1		3	42
Dysentery, unspecified					5					5
German measles		6		55	21		3	8	7	100
Influenza		26			5					31
Measles		108	19	969	878	34	10	115	11	2,144
Meningitis, meningococcus					3		1		2	6
Mumps		2		52	310	57	117	68	193	799
Poliomyelitis				1						1
Scarlet fever		5	3	115	51	3	8	14	6	205
Tuberculosis (all forms)		5	16	119	51	10	21	42	27	291
Typhoid and paratyphoid fever		1		17	3		1		4	26
Undulant fever				2	2	1				5
Venereal diseases:										
Gonorrhea	2	21	10	89	153	63	35	54	84	511
Syphilis	2	7	5	89	103	10	11	11	29	267
Other forms							2			2
Whooping cough		36		55	73	2		5	1	172

FINLAND

Notifiable diseases—March 1946.—During the month of March 1946, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	13	Paratyphoid fever	233
Diphtheria	1,020	Poliomyelitis	8
Dysentery, unspecified	18	Scarlet fever	233
Gonorrhea	1,358	Syphilis	563
Malaria	2	Typhoid fever	68

NEW ZEALAND

Notifiable diseases—4 weeks ended March 23, 1946.—During the 4 weeks ended March 23, 1946, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	12		Ophthalmia neonatorum	4	
Diphtheria	78	2	Poliomyelitis	7	
Dysentery:			Puerperal fever	3	
Amebic	13		Scarlet fever	140	
Bacillary	13	1	Tetanus	2	
Erysipelas	17		Trachoma	2	
Food poisoning	26		Tuberculosis (all forms)	176	40
Influenza	1		Typhoid fever	13	
Malaria	8		Undulant fever	4	

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Typhus Fever

Mexico.—For the month of April 1946, 121 cases of typhus fever were reported in Mexico. States reporting the highest incidence are: Federal District, 37 cases; Mexico State, 11; Nuevo Leon, 10; Quintana Roo, 9.

Morocco (French).—For the period May 11–20, 1946, 192 cases of typhus fever were reported in Morocco. No specific locations were given in the report.

Peru.—For the month of March 1946, 55 cases of typhus fever were reported in Peru. Departments reporting the highest incidence are: Cuzco, 20; Junin, 11; Puno, 9; Ayacucho, 7.

Turkey.—For the week ended May 25, 1946, 60 cases of typhus fever were reported in Turkey, all cases being in the interior of the country.

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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Public Health Reports

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Public Health Reports

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CONCLUSIONS CONCERNING PSYCHIATRIC TRAINING AND CLINICS [1]

Meeting of Consultants in Mental Hygiene, United States Public Health Service, September 6, 1945

I. PSYCHIATRIC TRAINING

A. ***Undergraduate training***

1. *Premedical.*

It is recommended, in order to improve the psychiatric training of the general practitioner, that admission requirements for medical students include more instruction during the premedical years in the Humanities. It is also desirable that the use of the scientific method be fostered.

2. *Medical.*

(*a*) *Objectives.*—The following should be the objectives of undergraduate instruction:

(1) To teach fundamental concepts of human behavior; i. e., motivation, gratification, and conflict.

(2) To teach the emotional experiences of sick people. The student should also be made aware of his own emotional relationship to his patient.

(3) To teach that emotional disturbances as well as toxic, metabolic, or physical factors produce illness.

(4) To teach an understanding of illness associated with or caused by disturbed cerebral metabolism.

(5) To teach some classificatory knowledge of psychiatric diagnostic syndromes.

(6) To teach useful diagnostic and interviewing techniques.

(7) To assist the student in gaining insight into his own personality make-up and particularly his emotional biases, prejudices, and blind spots, preferably through intimate contact with the psychiatric teacher.

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[1] From the Mental Hygiene Division, Bureau of Medical Services.

(8) To give a reasonable concept of methods of psychotherapy and an appreciation of his own potentialities and limitations in this regard.

(*b*) *Standards for teaching staff.*—To give acceptable training, a medical school should offer interdepartmental training in psychiatry, under the direction of a full-time professor of psychiatry and such additional staff members, including residents, as are indicated by the size of the student body. The nonpsychiatric staff should have a good understanding of psychiatry, and the psychiatric staff, in turn, must have a good understanding of general medicine.

(*c*) *Standards for clinical facilities.*—Minimum clinical facilities for adequate teaching are:

(1) Liaison with out-patient and in-patient services of other departments. Psychiatric examinations should be a routine part of the medical study.

(2) Modern, thoroughly equipped psychiatric hospital or in-patient, acute service of not less than 50 beds or 1 bed per senior student (whichever is the larger). These beds must be a part of the medical school facilities or in institutions in which the treatment of patients is under the control of a member of the medical school faculty and where the clinical material is suitable for undergraduate teaching.

(3) There should be out-patient facilities in connection with the medical school in which the case load is large enough to provide sufficient patients with psychiatric diagnostic and treatment problems so that all junior and senior students can work with at least two such cases.

(*d*) *Standards of curriculum:*

(1) It is recognized that the teaching of basic psychiatric understanding essential to the practice of medicine, even more than instruction in psychiatry as a specialty, has been severely limited by the lack of adequately trained teachers. It is recommended that, as instructors and facilities become available, the teaching of both phases of psychiatry be given a place in the curriculum consistent with the proportion of patients with psychiatric difficulties that the physician encounters in general practice.

(2) The undergraduate training curriculum should offer courses essential to psychiatric understanding in all years of the medical school.

B. ***Interne training***

1. It is desirable that there be a rotating psychiatric in-patient and out-patient service or affiliation in connection with the hospital.

2. It is essential that there be clinical experience in out-patient and in-patient psychosomatic medicine in which psychiatric consultation is utilized.

C. *Graduate training*

1. *Prerequisite for graduate training:*

(*a*) Graduation from an approved medical school and completion of an approved interneship.

(*b*) Broad cultural and educational background.

(*c*) Good scholastic average in college and medical school.

(*d*) Demonstrated genuine ability and a sincere interest in psychiatry.

(*e*) Freedom from mental illness or psychopathy.

(*f*) In addition, it is desirable for applicants for training to have had at least one year of clinical experience after interneship.

2. *Objectives.*—The primary objectives of any institution giving graduate instruction shall be:

(*a*) To develop a psychiatric attitude.

(*b*) To provide training to meet the needs of psychiatrists in a wide variety of fields.

To satisfy these objectives, didactic instruction and/or supervised clinical experience must be provided in items *a* through *o* below. A knowledge of the other items listed should be acquired.

(*a*) The normal personality and interpersonal relationships
(*b*) Mental hygiene of children
(*c*) Psychopathology of adults and children
(*d*) Psychosomatic medicine
(*e*) Clinical psychiatry
(*f*) Psychotherapeutic techniques
(*g*) Orientation in the fields closely allied to psychiatry, including psychological tests and measurements
(*h*) Schools of psychiatric thought
(*i*) History of psychiatry
(*j*) Neuroanatomy
(*k*) Neurophysiology
(*l*) Neuropathology
(*m*) Clinical neurology
(*n*) Neuroroentgenology
(*o*) Basic psychiatric literature
(*p*) Sociology
(*q*) Nonpsychiatric literature basic to psychiatry
(*r*) Schools of philosophical thought
(*s*) Comparative religion
(*t*) Public speaking
(*u*) It is essential that out of the above experience the student be brought to a thorough understanding of himself.

3. *Standards for acceptable training centers:*

(*a*) General hospital facilities, including those in connection with medical schools, must have a special unit or department for the mentally ill, where a patient will be able to receive individual medical, psychiatric, nursing care and treatment, and individual service in the fields of occupational, recreational, physiohydrotherapy and allied therapies. Intensive psychotherapy, as well as any modern organic therapy must be considered the essence of the individual approach in each case. The size of such a unit or department should be related to the admission rate of such cases within a period of 2 or 3 months. This unit will have a small subunit for disturbed, acutely ill individuals who will receive the same individual care and treatment.

(*b*) Mental hospital facilities not in connection with medical schools should meet the standards of the American Psychiatric Association for psychiatric hospitals in order to serve as training centers for residents. A few exceptions to these standards are taken by the Mental Hygiene Consultants of the Public Health Service. These exceptions are given as footnotes to the American Psychiatric Association standards which follow.

Standards for Psychiatric Hospitals

1. All hospitals should have a small unit or department [which will take the place of the present receiving ward] [2] where patients upon admission will remain a brief period (usually not to exceed 2 weeks) to be classified and housed according to their condition. This unit will require the services of a psychiatrist for every 30 patients under observation; a graduate nurse for every 4 patients, and a trained attendant for every 6 patients under observation.

2. Approved hospitals should have a special unit or department for acutely mentally ill, where a patient will receive individual medical, psychiatric, nursing care and treatment, and individual services in the field of occupational, recreational, and allied therapy. Intensive psychotherapy, in conjunction with physiohydrotherapy, as well as modern organic therapy must be considered as indispensable in each case. The size of such a unit should accord with the admissions within a 3- to 6-month period. This unit will have a small subunit for disturbed, acutely ill individuals who will receive the same individual care and treatment.

All cases in the unit for acutely ill should be housed either in single rooms or in small dormitories. Such a unit will require a psychiatrist for every 30 patients; a graduate nurse for every 4 patients; a trained attendant for every 6 patients; a physio-hydrotherapist, an occupational therapist, and a recreational therapist for every 30 patients requiring such treatment, and any other service indicated.

3. Hospitals should have a unit or department for a convalescing group where a patient will receive somewhat similar care although not requiring as intensive treatment as in the unit for the acutely ill. The size of such a unit will be determined by the number of home convalescing patients during a period of six

[2] The phrase enclosed in brackets could well be eliminated according to the Mental Hygiene Consultants of the Public Health Service.

months.[3] Such a unit will require a psychiatrist for every 50 patients; a graduate nurse for every 10 patients; a trained attendant for every 7 patients; an occupational therapist for every 30 patients· a recreational therapist for every 50 patients, and any other service indicated.

4. Hospitals assuming responsibility for patients with a favorable prognosis but who require intensive prolonged treatment and care should have a unit or department for such patients. Such a re-educational service will require a psychiatrist for every 75 patients; a graduate nurse for every 25 patients; a trained attendant for every 8 patients; a physiohydrotherapist, an occupational therapist, and a recreational therapist for every 75 patients and any other service indicated. This unit will have a special subunit for chronic disturbed patients.

5. Hospitals receiving patients who require continued treatment should have a special unit or department [for such patients].[4] Such a unit will need a psychiatrist for every 200 patients; a graduate nurse for every 40 patients; a trained attendant for every 6 patients; a physiohydrotherapist for every 200 patients; an occupational therapist for every 50 patients; a re-educational therapist for every 50 patients; a recreational therapist for every 100 patients, and any other service indicated.

6. Hospitals receiving senile and arteriosclerotic patients should have a special unit or department for such patients. Such service will require a psychiatrist for every 200 patients; a graduate nurse for every 50 patients; a trained attendant for every 8 patients; an occupational-recreational therapist for every 100 patients and any other service indicated. This department will also include a special infirmary section with a graduate nurse in charge.

7. Hospitals should have a special unit known as medical and surgical department for patients who are actually physically ill, requiring either medical or surgical treatment. This unit will require well-trained physicians, who have had adequate experience in general medicine and general surgery, with some psychiatric background. This unit should meet minimal standards of the American College of Surgeons.

8. Mental hospitals receiving children under 16 years of age, will require a special unit or department known as the children's unit. Such a unit will require the Service of a psychiatrist, who has had training and experience in a child guidance clinic, and preferably pediatrics, for every 30 children; a graduate nurse for every 10 children; a trained attendant for every 7 children; a teacher for every 20 children; an occupational-recreational therapist for every 30 children; a physiohydrotherapist for every 30 children; and any other service indicated.

9. If a mental hospital receives alcoholics and/or other drug addicts, it should have a special unit or department for their care and treatment. Such a unit will require a psychiatrist for every 25 patients; a graduate nurse and a trained attendant for every 8 patients; a physiohydrotherapist for every 25 patients; an occupational therapist for every 50 patients; a recreational therapist for every 30 patients, and any other service indicated.

10. Mental hospitals should have a special unit or department for tuberculous patients. Such a unit will require the services of a physician experienced in the field of tuberculosis for every 75 patients and a psychiatrist for every 100 patients; a graduate nurse for every 5 patients; a trained attendant for every 6 patients; an occupational therapist for every 25 patients, and any other service indicated.

No institution can be considered a modern hospital unless it has adequate facil-

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[3] The Mental Hygiene Consultants of the Public Health Service interpret this sentence to mean the number of patients likely to leave for home during a period of 6 months.

[4] The phrase enclosed in brackets was added by the Mental Hygiene Consultants.

ities for all types of physical examinations and tests required by the American College of Surgeons, including well-organized clinical and pathological laboratories under competent direction; a roentgenological department; and a medical library under supervision of the clinical director.[5]

Every approved hospital should be under the management and direction of a superintendent, who should be a well-qualified physician and experienced psychiatrist with administrative ability, whose appointment and removal should not be controlled by partisan politics. In hospitals with a population of more than 1,000 patients there should be an assistant superintendent, who should be an experienced and well-qualified psychiatrist as well as a good administrator.

Since adequate service can be rendered to the patients only through a competent staff, it should be imperative for every mental hospital to have a very well-trained and experienced psychiatrist as clinical director, who will be the coordinator and stimulating head of the medical staff, and who will organize a systematic instruction and rotation of service for the members of the staff. He should institute and supervise seminars for scientific discussions at frequent intervals. Staff meetings should be held at regular intervals, not less than once a week, under the direction of the clinical director.

It is desirable that the superintendent or medical director, the assistant superintendent and the clinical director should be diplomates of the American Board of Psychiatry and Neurology.

Salaries for the above positions should at least be comparable to those of specialists in other fields of medicine in the respective communities.

Every member of the staff of each hospital should be encouraged to devote a certain number of hours per week to research or scientific study and investigation.

It is desirable that every mental hospital have a well-organized department of clinical psychology.

All nursing, including attendants, in the mental hospitals must be placed under the director of nursing, who would be responsible to the individual medical authority of each service, to the clinical director and the superintendent of the hospital.

It is desirable that the director of nurses should be a graduate of an approved school of nursing affiliated with a general hospital, who has the degree of Bachelor of Science of Nursing Education or its equivalent, and who has had a postgraduate course in psychiatric nursing in a recognized hospital. She should have had at least 5 years' experience including special training in administration.

It is desirable that every mental hospital should have a training school for nurses wherever possible, as well as affiliate nursing courses.

Mental hospitals should attempt to have a larger corps of well-trained psychiatric nursing instructors. Many hospitals have been impeded and retarded in their educational programs for nurses and attendants by the scarcity of properly qualified instructors. It is suggested that every hospital should attempt to develop a postgraduate course for such instructors at the university level, wherever possible, and under the control of the universities using mental hospitals for practical training.

Every approved hospital should have a minimum of 1 trained social worker for every 100 annual admissions, under the direction of a chief, who will so organize the department that there will be adequate pre-admission, admission, and follow-up services.

Psychiatric social workers should be graduates of an approved school of social

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[5] In the opinion of the Mental Hygiene Consultants of the U. S. Public Health Service, it is desirable that these facilities be present in the hospital, but the availability and use of a separate pathological laboratory is adequate. It is also their belief that facilities for autopsies should be available.

work with at least 800 hours of supervised work experience in a psychiatric agency.

The chief psychiatric social worker should have had 3 years' additional professional experience, at least 2 being in a psychiatric hospital and clinic.

Every mental hospital should have the services of a well-organized dental department, under the direction of a well-qualified dentist.[6]

Every hospital should have the services of a well-organized department of pharmacy.[7]

All nonmedical administration duties should be rendered through a special-service department, headed by the proper medical officer or business manager, under direction of the superintendent.

The medical record system in a mental hospital should be under the supervision of a medical records librarian, fully qualified and if possible accredited by the American Association of Medical Record Librarians.

Every hospital should have a regular library for the patients, under the direction of a librarian.

4. *Duration.*—The basic graduate training in psychiatry should consist of not less than 2 years of resident training, and preferably 3, which shall include both formal instruction and supervised clinical experience.

5. *Stipends.*—Stipends to residents and fellows must be adequate to permit completion of the required number of years of graduate study without undue financial sacrifice. The stipend should be in addition to maintenance and should be not less than $100 per month the first year, $150 per month the second year, and $200 per month for each additional year. Training centers must consider these stipends as educational subsidies and not as salaries for services rendered, and must not expect residents to replace a full-time physician. The educational program shall be considered remuneration to the resident in addition to his stipend and maintenance.

6. *Psychiatric subspecialties.*—At least 2 years of graduate psychiatric training shall be completed before entrance upon training in one of the psychiatric subspecialties. Approved subspecialty training should be for not less than 2 years or such period as may be established by a subspecialty board. The following shall be considered subspecialties in psychiatry:

(*a*) Psychoanalysis
(*b*) Child psychiatry
(*c*) Industrial psychiatry
(*d*) Public health
(*e*) Administrative psychiatry
(*f*) Medicolegal psychiatry
(*g*) Community, extramural psychiatry

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[6] In the opinion of the Mental Hygiene Consultants of the U. S. Public Health Service, it is desirable that each hospital have a well-organized dental department, but the availability and use of qualified dentists is adequate.

[7] In the opinion of the Mental Hygiene Consultants of the U. S. Public Health Service, it is desirable that each hospital have a well-organized department of pharmacy, but the availability and use of a good outside pharmacy is adequate.

D. ***Refresher and short courses for physicians and other disciplines***

1. Orientation for general practitioners, nonpsychiatric medical specialists, or nonmedical specialists
2. Refresher courses for specialists in psychiatry
3. Brief general or special training for selected groups:
   (*a*) Didactic only
   (*b*) Supervised clinical experience only
   (*c*) Didactic and supervised clinical experience

E. ***Necessity for and cost of additional training facilities***

1. The report of the Committee on Psychiatry in Medical Education to the American Psychiatric Association for 1936 shows that:

(*a*) Of 68 medical schools, 19 were reported as giving excellent psychiatric instruction; 30 were good in this respect; and 19 were indifferent or poor.

(*b*) Psychiatric faculty standards in regard to: (1) Training and experience; (2) number of hours spent in teaching; and (3) productivity, were excellent in 22 schools, good in 30, and indifferent to poor in 16.

(*c*) Clinical facilities were good in 25 medical schools, fair in 21, and inadequate in 22.

(*d*) There were 495 teachers of psychiatry or 7.28 per school.

(*e*) The Committee emphasized the need for greater stress on preclinical teaching.

2. *Deficit of psychiatrists.*—It has been calculated, as a conservative estimate, that the Nation needs approximately 10,000 psychiatrists. There are approximately 3,500 psychiatrists in the country at present. The fulfillment of this need cannot be attained in the immediate future because of the lack of teachers, facilities, and candidates. There is a deficit of 3,500 psychiatrists urgently needed for public service; i. e., mental hospitals, clinics, and teaching institutions.

There are 742 residences and fellowships in psychiatry listed by the American Medical Association. However, not all of these meet the requirements of the American Board of Psychiatry and Neurology Inc., for training leading to certification by that Board. The qualifications of the American Board of Psychiatry and Neurology for training centers are subscribed to by us. It would require approximately 100 years for the facilities qualified to give adequate training to fill the deficit. A reasonable goal is to meet this deficit of qualified psychiatrists within 24 years. In order to meet this goal, additional training centers will be required. However, pending the development of these additional training facilities necessary to give complete instruction to an adequate number of psychiatrists, short courses of instruction can be offered to equip men to perform limited specific

functions. These short courses can be given in the fully qualified training centers or in other institutions whose teaching facilities are limited to preparing men for specific phases of psychiatric practice.

Based on the Bureau of Census preliminary figures for 1943, it is estimated that there are 155,000 admissions to mental institutions of all types (includes Veterans' Administration facilities, but not military establishments). The great majority of these patients are psychotic. Allowing 3.5 such admissions a week for each resident, there is psychotic and severe neurotic clinical material enough for training 860 residents per year. This would allow for the graduation of 430 men a year, based on a 2-year training program. At this rate it would require 24 years to make up the deficit in psychiatrists, allowing for attrition. Better diagnostic and treatment facilities will increase the number of admissions, and hence the amount of clinical material, for a limited number of years. It is emphasized that the residents must have additional experience in treating much larger numbers of neurotic patients during their training period.

3. *Deficit of training facilities.*—Present facilities for postgraduate training will meet the needs of only one-third of the individuals desiring such training; i. e., those normally seeking to specialize in psychiatry plus those returning from the armed forces who have indicated a similar desire.

4. *Cost of personnel and facilities needed for proposed training:*

(*a*) It is desirable that residencies be fostered first in university hospitals for:

(1) The teaching staff and clinical material can be utilized for both graduate and undergraduate training; and

(2) The residents are highly valuable in undergraduate training and profit by their teaching experience.

(*b*) In medical schools where the instructional staff would divide its time between undergraduate and postgraduate students and where adequate physical facilities and clinical material are already available, but in which additional teaching personnel is required, it is estimated that a resident can be trained for $7,000 per year.

	Average amount each year for basic resident	*Average amount each year for sub-specialty resident*
Stipends	$1, 500. 00	$2, 400. 00
Quarters, subsistence, and laundry	630. 00	630. 00
Travel	300. 00	300. 00
Teaching personnel (½ teacher per resident)	3, 500. 00	3, 500. 00
Teaching materials	365. 00	365. 00
	$6, 295. 00	$7, 195. 00

This estimate is based on the assumption that the teaching personnel would participate in the instruction of both residents and medical students with all cost charged against resident training.

(*c*) In hospitals not training undergraduate students but where adequate physical facilities and clinical material are available, with the exception of sufficient teaching personnel, it is estimated that a resident can be trained for $5,000 per year.

	Average amount each year for basic resident	*Average amount each year for sub-specialty resident*
Stipends	$1, 500. 00	$2, 400. 00
Quarters, subsistence, and laundry	630. 00	630. 00
Travel	300. 00	300. 00
Teaching personnel (¼ teacher per resident)	1, 750. 00	1, 750. 00
Teaching materials	365. 00	365. 00
	$4, 545. 00	$5, 445. 00

(*d*) Using $6,000 as a round figure for the cost of training the residents in basic and subspecialty work at university and other hospitals, the annual cost for 860 residents will be $5,160,000.

(*e*) In those schools and hospitals where physical facilities are available but in which there is inadequate clinical material, it will be necessary to provide for the cost of maintaining such patients in the hospital. At $5 per diem per patient (exclusive of salary of teachers) and allowing for 180 patients per year per resident and estimating 6 weeks of hospitalization for each patient, it will require $37,800 per year to care for the clinical material of one resident.

(*f*) In schools and hospitals where physical facilities for the care of mentally ill patients are lacking, new construction will be necessary. Where no additional major auxiliary facilities are needed, it is estimated that this construction can be provided at $7,000 per bed. If all auxiliary facilities are needed, the estimated cost per bed is 11,000 dollars.

F. ***Need for Federal assistance***

1. There is an urgent need for 3,500 psychiatrists for employment in State and Federal mental institutions and by mental health authorities in the several States for extramural service to communities. The present facilities for training are concentrated largely in populous and wealthy States, and are maintained and operated either by State governments or private endowments.

Existing institutions are under no obligation, either legal or ethical, to incur additional expenses for the education of psychiatrists essential for public service beyond the needs of their own community. Indeed, State universities would be severely condemned for adding an additional burden on the taxpayers of the State for the training of citizens

of other States. Furthermore, the progressive decline in interest rates is making serious inroads in the income of endowed institutions and, at present, the decline is not being offset by comparable increases in income-bearing capital.

Twenty-one States have no postgraduate training facilities within their borders. Most of these States have insufficient economic resources to justify the capital outlay for the physical facilities necessary for training, and in some cases are unable to provide adequate clinical material necessary for instruction. Therefore, training facilities must continue to be concentrated to a large extent in the more populous and wealthy areas. If present facilities are to be expanded or new construction undertaken for the purpose of providing trained personnel for the entire Nation, it is the responsibility of the Federal Government to provide the needed assistance.

2. The Federal Government is obligated for the psychiatric care of veterans but this cannot be met with the existing number of psychiatrists. This implies an obligation on the part of the Government to assist in training the needed personnel.

3. In the past, the Government has recognized its responsibility to train individuals in fields essential to the national welfare where the need is urgent.

II. OUT-PATIENT CLINICS

A. *Standards*

We subscribe to the Standards for All-Purpose Out-Patient Psychiatric Clinics as set forth by the American Psychiatric Association. A few minor additions and deletions to these standards are given in footnotes which we believe are applicable to facilities organized under grants-in-aid to the States.

Standards for All-Purpose Out-Patient Psychiatric Clinics

Purpose

a. It should be the policy of the clinic to accept for consideration persons presumed by the referring agent to be in need of psychiatric help, to elicit the necessary facts and to determine the extent and type of service needed.

b. It should be prepared to clarify the medical (psychiatric) disorder as to its genesis and characteristics (diagnosis) and to interpret these findings to persons or agencies who must cooperate in treatment.

c. In the case of a psychiatric disorder it should be prepared to offer appropriate out-patient treatment or else to help the patient secure such treatment. It should thus be all-purpose in its perspective.

d. If it has not reached an all-purpose capacity, provision should be made for the complementary services through other agencies. This all-purpose capacity should include the following diagnostic and therapeutic services:

1. Pre-hospitalization services
2. Examination and treatment of nonhospital cases, adult and child

3. Supervision and treatment of provisional discharged or convalescent post-hospitalization cases
4. Supervision of care and custody cases (depending upon state policy)
5. Supervision of boarded out cases (depending upon state policy)
6. Consultation for the community agencies

e. An educational program should be one of the functions of the clinic, which should undertake to add to the body of psychiatric knowledge.

Auspices

The auspices should be such as to promote continuity,[7] collaborative community relationships and be flexible enough to allow for change.

Quarters

While the clinic may be centralized at a headquarters, it should, through branches if necessary, be brought close to the people it serves and should be on lines of transportation. The quarters should contain separate rooms for each of the professional staff, reception facilities and clerical record space adequate for the protection of records.

Clinics should be located preferably in connection with such institutions as general hospitals or public health centers.

Financing

The clinic should be operated on a budget sufficiently detailed to allow the calculation of case costs for the various services. Salaries should be adequate to maintain a stable staff of competent personnel, and should be not less than the average income of such specialists in the area served.

Operation

The clinic should have some morning, afternoon, and evening sessions. When several clinics serve a community they may share this coverage. Two such sessions a week is minimal for a clinic operating under one authority and budget.

Policies of intake in regard to type of patients, and financial limitations imposed upon admissions, should be defined and clearly made known to referring agencies. Admissions should be so limited that the psychiatrist's load can be handled in the time allotments specified above.

Affiliations

[Unless organized for profit],[8] the clinic should have an affiliation with a medical school, hospital, welfare, or public health department, or professional organization for the exchange of services, scientific advancement, and professional and administrative support. [If there is no such affiliation, as in the case of a clinic set up by a community fund or private resources, the clinic should have an organized board of directors.] [9]

Case records should reflect close collaboration with other community agencies. Such agencies and physicians should be the chief sources of reference of cases.

Staff

a. The clinic should be under the direction of a psychiatrist, working at least one-half time in the case of a full-time clinic.

b. The assistant staff should consist of psychiatrists and psychologists in the ratio of one psychologist for each one to two psychiatrists on full-time basis and

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[8] The phrase enclosed in brackets is not applicable to our policy and clinics organized for profit are not eligible for Federal assistance.

[9] This sentence is not applicable to our policy since assistance for clinics would be given to the State and determinations such as this would be made by the State.

two to three psychiatric social workers to each psychiatrist. There should be one clerical worker to each full-time psychiatrist.[10]

c. Qualifications.

Psychiatrists should have had (1) a general interneship, (2) at least 2 years of residency in psychiatry based upon a planned program of education, and (3) a year of supervised training in out-patient psychiatry with special emphasis on the neuroses; experience in clinical neurology, neuropathology, psychoanalysis, community education, and relevant laboratory procedures related to mental illness are desirable. The training in out-patient psychiatry should be in a clinic employing the coordinated services of a psychiatrist, psychologist, and psychiatric social worker. A chief psychiatrist should have had at least 5 years' experience in psychiatry including 2 years in a clinic and experience in clinic administration and community education.

Psychologists should have had a year of graduate study in psychology equivalent to that leading to a master's degree, including abnormal psychology, tests and measurements, statistics, educational psychology, remedial measures for learning disabilities, vocational counseling and supervised out-patient training of at least 1 year in a well-organized clinic, and 1 year of subsequent experience in such a clinic. This experience, dealing with both children and adults, should include delinquency, behavior problems, school maladjustments, physical handicaps, mental defect and disease, and vocational problems. A chief psychologist should have had 2 full years of graduate work and 5 years of experience including additional experience in a clinic with a psychiatrist and a psychiatric social worker.

Psychiatric social workers should be graduates of an approved school of social work with at least 800 hours of supervised field work experience in a psychiatric agency. A chief psychiatric social worker should have had 3 years' additional professional experience, at least 2 being in a psychiatric clinic employing a psychiatrist and psychologist.

d. Staff policy.

Full-time staff is preferable.

The director should give at least half time.

Staff should be large enough to ensure good clinical work.

New staff and especially trainees should be under a planned program of training including specific hours set aside for conference and supervision.

Social work staff should be full time.

Conferences should be scheduled weekly or oftener for the purpose of staff training, collective thinking on individual cases, and policy making. Conferences should be held between the members of the clinic staff and other social agencies.

e. There should be liaison and consulting arrangements with other agencies.

Case policy

Services should be varied and adjusted according to the needs of the case.

Services should be by appointment.

In general 1 hour should be allowed for each patient per visit.

Therapeutic activities by the nonpsychiatric staff should be delegated by the psychiatrist at his discretion and under his supervision and personal responsibility. The generally accepted functions of the psychologist and psychiatric social worker are carried as their professional responsibility.

Twenty treatment cases averaging one visit a week represent the maximum capacity per psychiatrist.

[10] We recommend not less than three clerical workers in any full-time clinic. Any clinic cooperating in research should have a record analyst in addition to other clerical help.

Recording

The important facts about a patient should be kept in typed permanent records in a locked file. This should be the combined record of all staff members on the case. [In addition to the above, we recommend the maintenance of standard records which are suitable and available for statistical evaluation.][11]

Reports

a. The content of a report should be adjusted to the purpose of the agency reported to, and in keeping with ethical practice.

b. In general a report should contain

1. A summary of the problems as referred and accompanying data.
2. Additional and confirming data resulting from clinic work.
3. A diagnosis in the form of a brief genetic reconstruction of the disorder.
4. The classification according to standard nomenclature.
5. Treatment given or required and recommendations and plans
6. Prognosis and factors that will influence outcome.

The quality of records and reports is best determined by inspection of unselected samples.

Education

Education should be a part of the clinic function. This may include:

1. General public education regulated by policies designed to avoid waste of staff time
2. Professional education of related persons and agencies through work on cases and other means
3. Training of psychiatrists, psychologists, and psychiatric social workers within the clinic itself

Types of service should include:

a. Consultation
b. Diagnostic study and report
c. Reference of patient and other medical examinations and treatments, not provided at the clinic
d. Treatment
[e. Prevention through counseling, dissemination of information, etc.][12]

B. *Annual cost of a clinic (See following schedule for details)*

Personal services	$25, 700. 00
Other services	6, 490. 00
Total	$32, 190. 00

III. DEMONSTRATION PROJECTS

A. *Types*

1. Clinics
2. Training
3. Psychiatric hospital care and teaching
4. Psychiatric care in general hospitals
5. Case finding and preventive psychiatry

[11] Added to the American Psychiatric Association's Standards by Mental Hygiene Consultants of the Public Health Service.

[12] Added to the American Psychiatric Association's Standards by Mental Hygiene Consultants of the Public Health Service.

6. Epidemiologic studies
7. Mental health education
8. Community organization for better mental health
9. Follow-up on paroled and discharged patients with emphasis on family care

B. *Selection of sites*

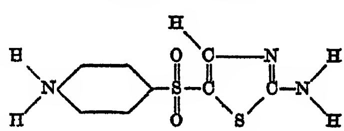
These should be in centers of population where there is considerable need, but where there is also evidence of prompt acceptance and use of such facilities, and where there is a strong hospital or university connection to insure continuity of service and especially stability of its educational functions. In negative terms, it is wise to avoid places where much persuasion and effort would be required in establishing the clinics, and where the enterprise might collapse after withdrawing initial support.

PROMIZOLE TREATMENT OF LEPROSY

A Preliminary Report [1]

By G. H. FAGET, *Medical Director*; R. C. POGGE, *Senior Assistant Surgeon (R)*; and F. A. JOHANSEN, *Senior Surgeon (R), United States Public Health Service*

Promizole is the trade name for 2, 4′-diamino-5-thiasolylphenyl sulfone, which has the following structure:



It was synthesized [2] primarily for the treatment of mycobacterial diseases, since promin had been found too toxic for continuous oral administration in these diseases. In preliminary experimental and clinical tuberculosis, promizole did not produce sufficiently encouraging results to warrant further investigation; however, good results were obtained in tuberculosis of the skin (*1*). For this reason and because of its relative nontoxicity by mouth and its close resemblance to promin and diasone, which had been used with some success in the treatment of leprosy (*2*), (*3*), (*4*), (*5*), it was considered feasible to test the possible therapeutic effect of promizole on leprosy at the National Leprosarium.[3] The present preliminary report is published because clinical improvement in patients under treatment for leprosy seems to appear in some cases more rapidly with promizole than with

[1] From the U. S. Marine Hospital (National Leprosarium), Carville, La.
[2] By Parke Davis & Co.
[3] The promizole used in this experimental study was supplied gratis by Parke Davis & Co. through the courtesy of Dr. E. A. Sharp, Director of Experimental Research.

either promin or diasone. Past experiments with other sulfa drugs given orally, particularly sulfanilamide (*6*), have proved unsuccessful in this institution.

At present 7 of the original group of 11 patients have been under treatment with promizole for approximately 1 year. These patients were started on doses of 0.5 gm. three times daily, dosage being gradually increased to 2 gm. three times daily, over a period of several weeks.

In 2 of the original 11 patients it was necessary to discontinue the drug because of toxic reactions—general malaise in 1 patient, and repeated febrile episodes in the other. Discontinuance of medication in the other 2 patients was not incidental to the drug; 1 absconded from the institution, and the other died of a cerebrovascular accident.

After 6 months of treatment, objective clinical improvement was observed in some of the patients. Because of these encouraging results, 8 more patients were started on the promizole treatment, making a total of 15 under treatment at the present time. Others will be added when more of the drug becomes available. Some of the last 8 patients started on this treatment have already shown benefits (figs. 1 and 2), but for the most part it is as yet too early to evaluate the therapeutic effects of the drug in this latter group.

This report is, therefore, based primarily upon the effects of promizole in the group of seven patients who have undergone treatment for a period of at least 1 year. All of these patients have tolerated the drug well in doses up to 6 gm. daily. Brief clinical abstracts of these seven cases are included below.

CASE REPORTS

Case 1: Registered No. 1452.—Mexican male, 35 years of age, had fairly early active mixed type of leprosy at beginning of treatment with promizole. The disease was of about 6 years' standing. Prior to April 1945, when promizole was begun, he had received only 11 intramuscular injections of chaulmoogra oil with benzocaine in 1941 and 16 in 1942 and chaulmoogra oil by mouth in doses of 25 minims three times per diem regularly from 1942 to the beginning of 1945. Promin had then been given intravenously for a period of 3 months but was discontinued because of the patient's dread of the needle. During this period his leprous lesions had not improved. When promizole was begun, the clinical findings were as follows: Discrete eruption of brown nodules over the face, ears, limbs, and body, becoming confluent in some areas over face and ears; and some areas of anesthesia over feet, ankles, and lower third of legs. Nasal and skin smears were positive for *Mycobacterium leprae*.

Promizole was administered in doses of 6 gm. daily after the first 3 months for a period of 11 months. Improvement was noted in the shrinking of all nodules. The patient was bacterioscopically negative in November and December 1945, and continues negative in the April 1946 test, no test having been made in the 3 months' interim.

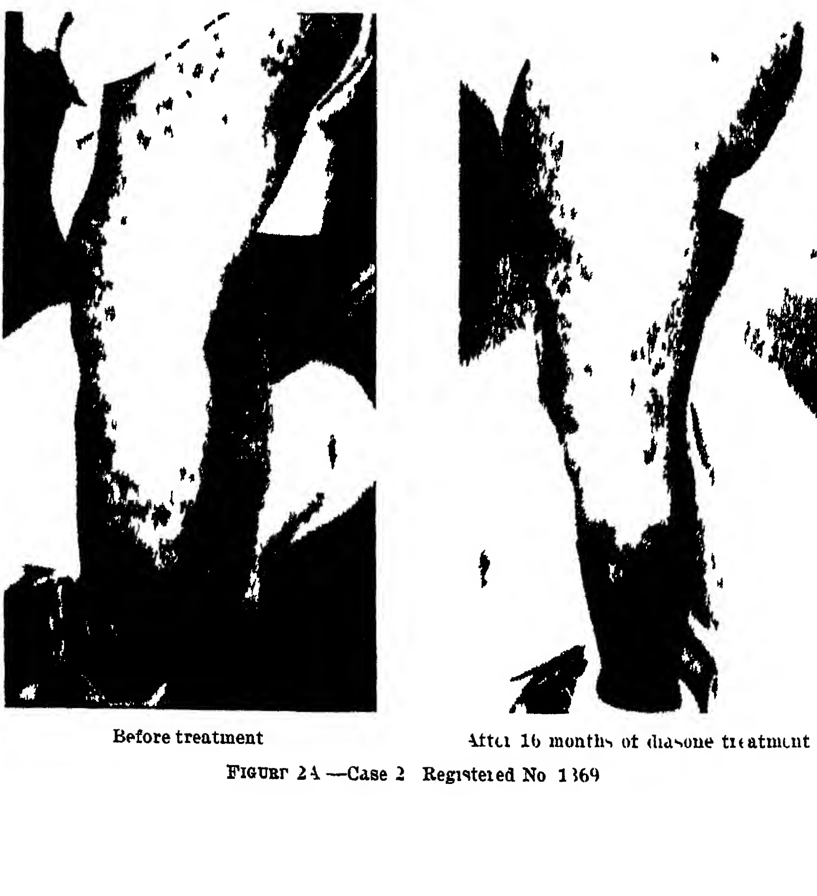
Before treatment

After 2 years of diasone

FIGURE 1.—Case 1. Registered No. 1619

Before treatment After 16 months of diasone treatment

FIGURE 2.—Case 2 Registered No 1369



Before treatment After 16 months of diasone treatment

FIGURE 2A.—Case 2 Registered No 1369

Before treatment. After 1 year of diasone treatment.

FIGURE 3.—Case 3: Registered No. 1676.

Before treatment. After 18 months of diasone treatment.

FIGURE 4.—Case 4: Registered No. 1566.

Case 2: Registered No. 271.—White male, 50 years of age, with advanced mixed type leprosy of about 25 years' duration. Clinical manifestations were total blindness; leprous laryngitis; nodules scattered over arms, legs and face; and many ulcerations on legs and plantar trophic ulcers. No improvement had been noted with oral and intramuscular injections of chaulmoogra over many years. Skin tests were positive for *M. leprae.*

Promizole was started in March 1945. There is definite improvement after 1 year of treatment. Voice is normal, all ulcerations are healed, and all nodules are considerably flattened, but bacterioscopy remains positive.

Case 3: Registered No. 1691.—White male, 28 years of age, with early mixed type of leprosy, of about 3 years' duration. Clinical manifestations were nodules of both ears; diffuse thickening of skin over face; and anesthesia in both legs and arms in scattered areas. He had taken no previous treatment. Skin smears were positive for *M. leprae.*

Promizole was given in doses increasing from 1.5 to 6 gm. daily for 1 year. There is slight evidence of flattening of nodules on ears, and skin over face is less thickened. Bacterioscopy remains positive.

Case 4: Registered No. 1445.—Filipino male, 42 years of age, with advanced mixed type of leprosy of about 10 years' duration. Clinical manifestations were many scattered nodules varying in size and occurring over face, limbs, and body; diffuse thickening of skin over face, brow, ears, hands, feet, and legs; extensive areas of anesthesia over legs and arms; small ulcers over lips and around nose; and atrophy of interosseous muscles of both hands. No improvement had been noted with oral or intramuscular injections of chaulmoogra oil. Skin and nasal smears always were positive for *M. leprae.*

Promizole was given in doses increasing from 1.5 gm. to 6 gm. daily for 1 year. There is a definite flattening of nodules, and ulcerations have healed. Bacterioscopy is still positive.

Case 5: Registered No. 277.—Colored male, 37 years of age, with advanced lepromatous leprosy of about 24 years' duration. Clinical manifestations were total blindness; much scarring over face and upper and lower extremities from old ulcerating nodules and trophic ulcers; scattered large nodular lesions of neck; and diffused infiltration of extremities. He had many different treatments during past years without benefit except from sulfathiazole, 1.5 gm. daily, which had resulted in healing of all ulcerations but had not affected nodular lesions or leprous infiltrations. At the time promizole was begun, all ulcerations had been healed. Skin smears were positive for *M. leprae.*

Promizole was given in daily doses increasing from 1.5 gm. to 6 gm. for 1 year. Nodular lesions have become smaller and flattened. Skin smears continue positive for *M. leprae.*

Case 6: Registered No. 1690.—Mexican male, 26 years of age, with early mixed type of leprosy of about 4 years' duration. Clinical manifestations were nodules over ears; a few scattered nodules over legs and arms; anesthesia in areas over legs and arms; a superficial ulcer on dorsum of right hand, and another, 2 x 3 cm., over left Achilles tendon. Skin smears were positive. He had taken no other treatment.

Promizole, starting with 1.5 gm. and increasing to 6 gm., was given daily for 1 year. Ulcers have healed, and there is a shrinking of nodules over ears, legs, and arms but skin smears remain positive.

Case 7: Registered No. 1498.—White male, 68 years of age, with moderately advanced lepromatous leprosy of about 7 years' duration. Clinical manifestations were many discrete nodules over ears, on arms to shoulders, and on both legs from knees to toes and thighs to hips. Some were slightly flattened. There

was also some thickening of skin over face, nose, forehead, hands, and arms. There were no ulcerations. Skin and nasal smears were positive for *M. leprae.*

Promizole was given in increasing doses from 1.5 gm. to 6 gm. daily for 1 year. Condition appears stationary. Possibly, thickening of skin over face is slightly improved. Bacterioscopy remains positive.

CONCLUSION

No claim is made in regard to the ultimate value of promizole given orally in doses of 6 gm. daily in the treatment of leprosy. Attention is called to the fact that promizole is well tolerated by patients with leprosy and that clinical improvement occasionally can be demonstrated more quickly with promizole than with similar sulfones, such as promin and diasone. It is felt that the therapeutic results thus far obtained are sufficiently encouraging to warrant further clinical study, which will be necessary before a final evaluation of promizole in the treatment of leprosy can be given.

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PRESENT STATUS OF DIASONE IN THE TREATMENT OF LEPROSY

Brief Clinical Note [1]

By G. H. Faget, *Medical Director*; R. C. Pogge, *Senior Assistant Surgeon (R)*; and F. A. Johansen, *Senior Surgeon (R)*, *United States Public Health Service*

The clinical improvement of patients suffering from leprosy when treated with diasone (disodium formaldehyde sulfoxylate diamino diphenyl sulfone (Abbott)) is well known (*1*), (*2*). The purpose of this present brief clinical note is to summarize the status of 104 patients treated at the National Leprosarium with 17,200 gm. of diasone over the past 2½ years. In all cases the drug has been used by mouth in daily doses varying for adults from 0.33 gm. to 1.00 gm. and for children from 0.17 gm. to 0.5 gm. The drug has an advantage over

[1] From the U. S. Marine Hospital (National Leprosarium), Carville, La.

the other sulfone drug, promin, which is being used in the largest number of patients at the National Leprosarium (*3*), in that diasone is well tolerated by mouth by most patients whereas promin usually has to be given intravenously because of its toxicity by mouth.

At the present time, 66 of the 104 patients (63.5 percent) have received treatment with diasone for 6 months or longer. Of these 66 treated patients, 74.2 percent were predominantly lepromatous cases, 20.4 percent were frankly mixed in type, and only 5.4 percent were neural. In 30 percent, leprosy was far advanced, and in 51 percent was moderately advanced; in 19 percent, the lesions were minimal in character.

At the present time, 24 percent of the diasone-treated patients are bacteriologically negative for *Mycobacterium leprae* in skin scrapings. This percentage compares favorably with the highly encouraging results that have been reported from the use of promin intravenously (*3*).

There is objective improvement in the specific leprous lesions (nodules and diffuse infiltrations) in 65 percent of the patients who have been treated for 6 months and longer. There is another 12 percent in whom the improvement is limited to changes in various nonspecific infections which appear to benefit from diasone therapy. In the remaining 23 percent the improvement is largely subjective, and no demonstrable change is claimed. There are no cases that are clinically worse.

There is an additional 6.7 percent of the group of 104 patients who have received diasone for less than 6 months. No comments are made on their clinical conditions, since 6 months appears to be the time needed for changes in the specific lesions to become manifest under diasone treatment.

The remaining 29.8 percent (31 patients) have discontinued diasone treatment for the following reasons:

	Percent
Absconded from the institution (6 cases)	5. 76
Increased erythema nodosum, with fever (5 cases)	4. 81
Eczematoid dermatitis (5 cases)	4. 81
Gastric intolerance (5 cases)	4. 81
Hematuria (4 cases)	3. 85
Anemia (2 cases)	1. 92
Iridocyclitis (2 cases)	1. 92
Drug fever (1 case)	0. 96
Hypertension (1 case)	0. 96
Total	29. 8

The following brief clinical abstracts, representative of a much larger group, will serve to demonstrate more clearly the therapeutic action of diasone in leprosy.

CASE REPORTS

Case 1: Registered No. 1619.—Colored male, 7 years of age, with moderately advanced lepromatous leprosy of 3 years' duration. Clinical manifestations were: Multiple nodules scattered over the face; plaques on the right side of the forehead and the left cheek; infiltrated and scattered nodules of the forearms, hands, buttocks, thighs, legs, and feet; and evidence of leprous rhinitis. No improvement was noted with oral administration of chaulmoogra oil. Skin and nasal smears were always positive for *M. leprae*. Diasone was given in ⅓-gm. doses daily for a total of 127 gm. to date. Definite improvement after 2 years of treatment is shown in the illustrations (fig. 1). Skin smears are persistently positive.

Case 2: Registered No. 1369.—Mexican female, 55 years of age, with moderately advanced mixed type leprosy of about 16 years' duration. Clinical manifestations were: Almost generalized nodular eruption, some of which occurred in discrete nodules but most in confluent nodular masses, over face, ears, dorsal surfaces of limbs, and back; and extensive areas of anesthesia over limbs to above knees and elbows. She had taken chaulmoogra oil both orally and intramuscularly over a period of 3 years. There had been at times some slight improvement in lesions over some areas but advancement in others, especially over back and legs, which became progressively worse. Skin and nasal smears were always positive for *M. leprae*. Diasone has been given since January 8, 1945, for a total of 358 gm. Definite improvement is shown in the illustrations (figs. 2, 2A). Skin smears are still positive.

Case 3: Registered No. 1676.—White male, 40 years of age, with moderately advanced mixed type of leprosy of about 10 years' duration. Clinical manifestations were: Diffuse infiltration and nodules over face, forehead, and ears; small discrete nodules scattered over legs, arms, and buttocks; pigmented macules up to 6 cm. in diameter over arms; diffuse pigmentation of forearms, hands, and legs; several annular macules of lower back; and anesthesia of macules on back, both legs distal to knees, ulnar surface of both forearms, and dorsum of left hand. Skin and nasal smears were positive for *M. leprae*. He was started on diasone shortly after admission and has taken a total of 209 gm. Definite improvement is shown in the illustrations (fig. 3). Skin smears continue positive.

Case 4: Registered No. 1566.—Colored male, 32 years of age, with moderately advanced lepromatous leprosy of about 6 years' duration. Clinical manifestations were: Multiple nodules scattered over forehead, ears, cheeks, and nose; and a few small nodules scattered over both arms and legs. No improvement was noted with chaulmoogra oil given orally and intramuscularly over a period of 2 years. Skin and nasal smears were always positive for *M. leprae*. Diasone was given for 17 months, totaling 338 gm. Definite improvement is to be noted in illustrations (fig. 4). There is no evidence at the present time of active lesions, and the patient has been bacterioscopically negative for 11 consecutive months.

DISCUSSION

It would appear from our clinical observations that diasone has an action similar to that of promin, which has been reported in considerable detail (*3*). Treatment with diasone has the advantage that the drug is tolerated by mouth in doses up to 1.0 gm. daily for long periods of time. The reasons for stopping the drug have been listed. The number of patients in whom treatment was discontinued because of anemia is low, because many of the patients receive liver or iron prod-

October 1945
(Before treatment)

January 1946
(After treatment)

Right arm

October 1945
(Before treatment)

January 1946
(After treatment)

Left arm

FIGURE 1 —Case No 1285 illustrating rapid changes in lepromatous lesions after only 3 months of treatment with promizole

ucts with the diasone. The number in whom treatment was discontinued because of hematuria is limited to four patients, who were started with doses of 1.0 gm. daily early in the study. At the present time diasone is administered in doses of 0.33 gm. daily for the first 2 weeks and then gradually increased to 1.0 gm. Since the adoption of this policy there have been no further cases of hematuria.

CONCLUSION

Diasone, a derivative of diamino diphenyl sulfone, is suitable for oral administration in the treatment of leprosy. Patients with leprosy usually improve clinically within the first 6 months of treatment with diasone in adult doses of 1 gm. daily.

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DEATHS DURING WEEK ENDED JUNE 1, 1946

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 1, 1946	Corresponding week, 1945
Data for 93 large cities of the United States:		
Total deaths	8,272	8,680
Average for 3 prior years	8,708	
Total deaths, first 22 weeks of year	213,417	207,714
Deaths under 1 year of age	614	555
Average for 3 prior years	602	
Deaths under 1 year of age, first 22 weeks of year	13,470	13,597
Data from industrial insurance companies:		
Policies in force	67,201,952	67,350,674
Number of death claims	8,971	11,737
Death claims per 1,000 policies in force, annual rate	7.0	9.1
Death claims per 1,000 policies, first 22 weeks of year, annual rate	10.5	10.9

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 8, 1946

Summary

A total of 161 cases of poliomyelitis was reported for the week, as compared with 145 last week and 92 for the corresponding week last year. The latter figure was the largest reported for a previous corresponding week in the past 11 years. States reporting 5 or more cases are as follows (last week's figures in parentheses): *Increases*—New York 6 (4), Kansas 7 (1), Florida 33 (31), Louisiana 9 (3), Texas 35 (26), California 15 (11): *decreases*—Alabama 15 (26), Colorado 5 (6). The total to date for the country as a whole is 1,195, as compared with 903 for the same period last year. Since March 16 (the approximate date of lowest weekly incidence in both years) 729 cases have been reported, as compared with 506 for the same period last year and a 5-year median for the period of 323.

No new case of smallpox was reported during the week in either California or Washington. Only 4 cases were reported for the country as a whole—1 each in Illinois, Iowa, Kansas, and Colorado. The total to date (of which 13 occurred in California and 68 in Washington) is 236, as compared with 224 for the same period last year and a 5-year median of 514.

A further slight decrease occurred in the incidence of measles. Of the total of 25,041 cases reported currently, as compared with 26,347 last week and a 5-year median of 14,662, approximately 68 percent occurred in the New England, Middle Atlantic, and East North Central areas. The total for the year to date is 567,487, as compared with 79,259 and 551,742, respectively, for the same periods of 1945 and 1944.

A total of 229 cases of diphtheria was reported, as compared with 290 last week. Both the current total and the cumulative figure (7,725) are above the respective corresponding figures of any of the past 6 years.

Deaths recorded during the current week in 93 large cities of the United States totaled 9,171, as compared with 8,272 last week, 8,890 and 8,360, respectively, for the corresponding weeks of 1945 and 1944, and a 3-year (1943–45) average of 8,818. The total to date is 222,588, as compared with 216,604 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended June 8, 1946, and comparison with corresponding week of 1945 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45	Week ended—		Median 1941–45
	June 8, 1946	June 9, 1945		June 8, 1946	June 9, 1945		June 8, 1946	June 9, 1945		June 8, 1946	June 9, 1945	
NEW ENGLAND												
Maine	3	0	0	---	---	---	203	3	113	0	1	1
New Hampshire	0	0	0	1	---	---	57	3	5	0	0	0
Vermont	0	5	0	---	---	---	182	31	85	2	0	0
Massachusetts	1	4	2	---	---	---	2,596	354	877	1	7	7
Rhode Island	0	0	0	---	19	---	138	11	11	0	1	1
Connecticut	0	1	1	1	1	---	636	89	342	1	1	1
MIDDLE ATLANTIC												
New York	29	10	8	[1] 2	[1] 2	[1] 2	3,745	142	1,268	14	21	21
New Jersey	4	4	5	3	2	2	3,575	57	713	6	3	3
Pennsylvania	11	11	14	---	1	---	1,639	620	715	5	13	13
EAST NORTH CENTRAL												
Ohio	6	4	4	3	4	3	888	53	315	5	14	14
Indiana	2	1	3	3	13	1	192	49	73	1	0	1
Illinois	11	4	19	7	7	7	585	401	401	5	10	10
Michigan [2]	6	9	5	1	---	---	785	251	461	4	5	5
Wisconsin	3	0	1	22	21	20	1,776	155	1,431	3	5	8
WEST NORTH CENTRAL												
Minnesota	5	1	1	---	---	---	93	17	309	1	1	1
Iowa	3	4	3	---	---	---	244	63	97	0	1	0
Missouri	0	3	0	1	11	---	108	45	185	4	6	6
North Dakota	1	1	1	---	1	2	16	2	21	0	0	0
South Dakota	0	4	1	---	---	---	12	36	14	0	1	0
Nebraska	0	2	2	---	---	1	152	105	89	0	1	0
Kansas	13	2	3	2	---	---	215	41	177	1	1	1
SOUTH ATLANTIC												
Delaware	0	0	0	---	---	---	24	4	10	3	0	0
Maryland [2]	13	12	6	---	1	1	717	25	204	1	0	8
District of Columbia	1	0	0	---	---	---	137	2	60	0	1	1
Virginia	4	3	3	71	76	76	653	32	219	2	3	3
West Virginia	1	1	2	---	---	1	150	6	33	3	2	2
North Carolina	16	2	4	---	---	2	287	29	262	1	2	2
South Carolina	3	7	3	136	74	80	378	32	77	0	1	1
Georgia	2	4	3	7	5	6	64	4	37	1	4	2
Florida	5	1	2	2	---	2	93	1	71	1	1	1
EAST SOUTH CENTRAL												
Kentucky	5	0	2	---	---	2	71	13	42	0	1	1
Tennessee	1	0	2	9	23	16	186	63	77	2	6	6
Alabama	5	4	2	23	9	14	157	5	71	3	5	2
Mississippi [2]	6	5	3	---	---	---	---	---	---	4	1	1
WEST SOUTH CENTRAL												
Arkansas	1	2	4	21	15	12	131	61	68	0	3	0
Louisiana	0	0	1	1	---	1	34	52	21	0	0	2
Oklahoma	1	9	2	13	31	23	94	33	38	3	2	0
Texas	24	28	22	256	393	287	1,000	271	271	3	8	3
MOUNTAIN												
Montana	0	0	0	---	3	3	153	7	43	1	0	0
Idaho	1	0	0	8	3	---	58	2	29	0	0	0
Wyoming	0	0	0	---	---	---	19	12	15	0	1	0
Colorado	4	7	8	3	63	22	303	10	151	0	0	0
New Mexico	1	2	1	1	---	1	61	1	12	0	0	0
Arizona	3	1	1	32	33	33	138	11	64	0	1	1
Utah [2]	0	0	0	---	---	---	212	212	112	0	1	1
Nevada	0	0	0	---	---	---	1	4	13	0	0	0
PACIFIC												
Washington	6	4	3	---	---	2	116	193	223	0	4	2
Oregon	1	5	1	---	7	7	205	89	89	1	0	2
California	27	11	16	8	13	42	1,762	1,458	1,458	11	9	9
Total	229	178	178	687	831	765	25,041	5,160	14,662	93	143	143
23 weeks	7,725	6,115	5,897	186,516	84,459	76,675	567,487	79,259	466,940	3,701	5,020	5,020

New York City only.

[2] Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended June 8, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Poliomyelitis: Week ended— June 8, 1946	Poliomyelitis: Week ended— June 9, 1945	Poliomyelitis: Median 1941–45	Scarlet fever: Week ended— June 8, 1946	Scarlet fever: Week ended— June 9, 1945	Scarlet fever: Median 1941–45	Smallpox: Week ended— June 8, 1946	Smallpox: Week ended— June 9, 1945	Smallpox: Median 1941–45	Typhoid and paratyphoid fever [2]: Week ended— June 8, 1946	Typhoid and paratyphoid fever [2]: Week ended— June 9, 1945	Typhoid and paratyphoid fever [2]: Median 1941–45
NEW ENGLAND												
Maine	0	0	0	18	38	13	0	0	0	1	0	0
New Hampshire	0	1	1	17	7	7	0	0	0	0	0	0
Vermont	0	0	0	3	10	5	0	0	0	1	0	0
Massachusetts	0	1	0	112	312	251	0	0	0	0	5	4
Rhode Island	0	0	0	3	5	8	0	0	0	0	0	0
Connecticut	1	0	1	28	45	43	0	0	0	0	1	1
MIDDLE ATLANTIC												
New York	6	11	4	398	526	344	0	0	0	4	7	7
New Jersey	0	0	0	155	112	112	0	0	0	1	1	2
Pennsylvania	3	1	0	209	412	219	0	0	0	5	4	6
EAST NORTH CENTRAL												
Ohio	4	0	0	224	336	229	0	1	1	1	4	4
Indiana	1	1	0	37	64	54	0	0	0	3	1	0
Illinois	4	2	2	173	205	146	1	0	0	2	1	2
Michigan [1]	0	0	0	115	234	178	0	0	0	2	1	2
Wisconsin	0	0	0	76	176	151	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota	3	0	0	45	77	40	0	0	0	0	0	0
Iowa	1	0	0	33	28	14	1	0	0	0	0	0
Missouri	2	0	0	12	44	44	0	0	0	1	0	1
North Dakota	0	0	0	0	18	6	0	0	0	1	1	0
South Dakota	0	0	0	8	26	8	0	1	0	0	0	0
Nebraska	0	0	0	9	28	17	0	0	0	0	0	0
Kansas	7	0	0	23	43	27	1	0	0	0	0	1
SOUTH ATLANTIC												
Delaware	0	0	0	0	3	4	0	0	0	0	0	0
Maryland [1]	0	0	0	68	125	39	0	0	0	1	1	1
District of Columbia	0	1	0	13	21	8	0	0	0	0	0	0
Virginia	0	2	0	43	65	20	0	0	0	2	0	3
West Virginia	1	1	0	20	36	18	0	0	0	1	2	2
North Carolina	*2	2	0	16	41	17	0	0	0	1	3	3
South Carolina	3	3	1	11	12	4	0	0	0	10	1	1
Georgia	1	0	0	7	14	9	0	0	0	5	0	9
Florida	33	1	0	2	2	1	0	0	0	2	5	5
EAST SOUTH CENTRAL												
Kentucky	0	0	1	16	25	25	0	0	0	6	5	4
Tennessee	3	2	1	11	31	28	0	0	0	1	1	4
Alabama	15	2	1	10	13	11	0	0	0	4	9	1
Mississippi [1]	1	0	0	5	5	3	0	0	0	0	0	2
WEST SOUTH CENTRAL												
Arkansas	2	1	1	4	3	3	0	2	1	5	0	5
Louisiana	9	1	1	5	19	4	0	1	1	4	4	4
Oklahoma	2	1	1	5	23	10	0	0	0	1	1	3
Texas	35	42	1	25	40	26	0	0	0	13	9	9
MOUNTAIN												
Montana	0	0	0	5	10	10	0	0	0	0	0	0
Idaho	0	0	0	2	7	7	0	0	0	2	0	0
Wyoming	0	0	0	10	4	5	0	0	0	0	0	0
Colorado	5	0	0	18	38	38	1	0	0	1	0	0
New Mexico	0	0	0	3	6	3	0	0	0	1	2	2
Arizona	1	0	0	4	8	8	0	0	0	1	2	1
Utah [1]	0	1	0	17	11	11	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	1	2	1	19	47	20	0	0	0	0	0	0
Oregon	0	0	0	26	17	12	0	1	1	0	1	1
California	15	13	9	150	326	173	0	0	0	5	8	3
Total	161	92	41	2,213	3,698	2,338	4	6	7	88	80	109
23 weeks	*1,195	903	586	77,487	120,416	87,636	236	224	514	1,268	1,401	1,790

[1] Period ended earlier than Saturday.

[2] Including paratyphoid fever reported separately, as follows: New York 1; Illinois 1; Michigan 1; Missouri 1; South Carolina 3; Georgia 2; Louisiana 3; California 1.

*Correction: North Carolina, week ended May 18, 1946, poliomyelitis, 2 cases (instead of 3).

Telegraphic morbidity reports from State health officers for the week ended June 8, 1946, and comparison with corresponding week of 1945 and 5-year median—Con.

Division and State	Whooping cough: Week ended— June 8, 1946	Whooping cough: Week ended— June 9, 1945	Whooping cough: Median 1941–45	Week ended June 8, 1946: Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
NEW ENGLAND											
Maine	19	41	32								1
New Hampshire	5		2								1
Vermont	38	32	7								3
Massachusetts	100	171	171				1				
Rhode Island	28	16	27								
Connecticut	65	41	53								
MIDDLE ATLANTIC											
New York	145	210	241	3	6		1	1			9
New Jersey	184	112	122			1					1
Pennsylvania	63	166	215					1			2
EAST NORTH CENTRAL											
Ohio	72	130	130								2
Indiana	46	34	34								
Illinois	97	48	102	5	1		1		1		17
Michigan [3]	71	45	218	1	1						2
Wisconsin	100	26	125						1		5
WEST NORTH CENTRAL											
Minnesota	9	11	22	2							
Iowa	14		23								16
Missouri	13	29	29								1
North Dakota			8			1					
South Dakota			4								2
Nebraska	1		9								
Kansas	26	31	55						1		2
SOUTH ATLANTIC											
Delaware	1	1	1					1			
Maryland [3]	26	88	88					2			
District of Columbia	6	3	11					1			
Virginia	76	132	65			50					
West Virginia	17	11	23								
North Carolina	108	158	160					5		3	
South Carolina	67	75	79		68						
Georgia	5	21	27	1	3					14	7
Florida	27	8	10							7	3
EAST SOUTH CENTRAL											
Kentucky	33	23	55		1					1	1
Tennessee	25	33	51			1	1	1			
Alabama	45	67	55							5	2
Mississippi [3]									2	1	3
WEST SOUTH CENTRAL											
Arkansas		18	42	3					2		4
Louisiana		5	5				1			1	3
Oklahoma	8	9	9								
Texas	180	266	266	19	303	88				18	13
MOUNTAIN											
Montana	1	3	6								
Idaho	14	1	1	1				3			
Wyoming		2	7								
Colorado	19	40	29		1			1			1
New Mexico	10	6	7								2
Arizona	17	11	11	2		66					
Utah [3]	12	25	62						1		
Nevada			2								
PACIFIC											
Washington	29	17	60								
Oregon	20	24	20								
California	44	489	489	2	1		2	1		2	10
Total	1,886	2,679	3,778	39	385	207	7	17	8	52	118
Same week, 1945	2,679			40	556	172	7	15	12	97	95
Average, 1943–45	2,885			54	524	179	12	[4] 21	20	[4] 44	
23 weeks: 1946	42,905			897	7,597	2,710	200	105	400	1,067	1,973
1945	57,437			721	9,918	2,690	156	90	363	1,270	2,062
Average, 1943–45	64,066		[4] 88,081	694	7,183	1,945	223	[4] 106	345	[4] 1,081	

[3] Period ended earlier than Saturday.
[4] 5-year median, 1941–45.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 1, 1946

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	38	0	2	1	9	0	0	2
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	------	0	0	0	0	0	0	------
Massachusetts:												
Boston	0	0	------	0	326	1	7	0	39	0	0	9
Fall River	0	0	------	0	66	0	1	0	4	0	0	1
Springfield	0	0	------	0	115	0	0	0	4	0	0	3
Worcester	0	0	------	0	423	0	5	0	10	0	0	39
Rhode Island:												
Providence	0	0	------	0	123	0	3	0	0	0	0	9
Connecticut:												
Bridgeport	0	0	------	0	3	0	0	0	0	0	0	1
Hartford	0	0	------	0	11	0	2	0	6	0	0	5
New Haven	0	0	------	0	50	0	1	0	1	0	0	------
MIDDLE ATLANTIC												
New York:												
Buffalo	11	0	------	1	29	0	3	1	3	0	0	8
New York	13	0	------	1	836	1	53	0	166	0	2	26
Rochester	0	0	------	0	147	0	0	0	10	0	0	2
Syracuse	0	0	------	0	13	0	2	0	4	0	0	2
New Jersey:												
Camden	0	0	------	0	10	1	0	0	3	0	0	1
Newark	0	0	1	0	151	0	4	0	9	0	0	29
Trenton	0	0	1	1	86	0	0	0	0	0	0	1
Pennsylvania:												
Philadelphia	3	0	------	0	240	1	14	0	48	0	0	11
Pittsburgh	1	0	1	0	15	2	8	0	18	0	0	4
Reading	0	0	------	0	2	0	1	0	3	0	0	1
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	------	1	20	0	2	0	9	0	0	1
Cleveland	0	0	3	1	162	0	7	1	34	0	0	17
Columbus	0	0	------	0	9	0	4	0	8	0	0	4
Indiana:												
Fort Wayne	0	0	------	0	3	0	1	0	1	0	1	------
Indianapolis	1	0	------	0	45	0	5	0	7	0	0	1
South Bend	0	0	------	0	2	0	0	0	5	0	0	------
Terre Haute	0	0	------	0	28	0	0	0	1	0	2	------
Illinois:												
Chicago	0	0	------	4	144	1	28	3	88	0	0	35
Michigan:												
Detroit	3	1	------	1	67	0	15	0	49	0	0	31
Flint	0	0	------	0	8	0	5	0	5	0	0	2
Grand Rapids	0	0	------	0	90	0	0	0	6	0	0	4
Wisconsin:												
Kenosha	0	0	------	0	0	0	0	0	1	0	0	------
Milwaukee	0	0	------	0	519	1	4	0	16	0	0	58
Racine	0	0	------	0	148	1	0	0	2	0	0	2
Superior	0	0	------	0	1	0	0	0	0	0	0	1
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	------	0	11	0	0	0	0	0	1	15
Minneapolis	3	0	------	0	24	1	1	1	14	0	0	1
Missouri:												
Kansas City	0	0	1	0	3	1	5	0	6	0	0	2
St. Joseph	0	0	------	0	1	0	0	0	0	0	0	------
St. Louis	0	0	1	0	113	0	10	0		0	1	5

City reports for week ended June 1, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	------	0	18	0	3	0	0	0	0	------
Kansas:												
Topeka	0	0	------	0	------	0	0	0	5	0	0	------
Wichita	0	0	1	0	16	0	6	0	3	0	0	3
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	2	0	0	0	0	0	0	------
Maryland:												
Baltimore	11	0	------	0	376	1	7	0	9	0	0	7
Cumberland	0	0	------	0	------	0	0	0	5	0	0	------
Frederick	0	0	------	0	1	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	1	168	0	6	0	8	0	0	10
Virginia:												
Lynchburg	0	0	------	0	20	0	1	0	0	0	0	------
Richmond	0	0	------	0	92	0	1	0	3	0	0	3
Roanoke	0	0	------	0	22	0	0	0	4	0	0	------
West Virginia:												
Charleston	0	0	------	0	6	0	0	0	0	0	0	1
Wheeling	0	0	------	0	------	0	1	0	1	0	0	15
North Carolina:												
Raleigh	0	0	------	0	2	0	1	0	0	0	0	------
Wilmington	1	0	------	0	7	0	1	0	0	0	0	------
Winston-Salem	0	0	------	0	9	0	0	0	3	0	0	9
South Carolina:												
Charleston	0	0	------	0	2	0	1	1	0	0	0	1
Georgia:												
Atlanta	0	0	------	0	37	0	5	0	1	0	0	------
Brunswick	0	0	------	0	------	0	0	0	0	0	0	------
Savannah	0	0	------	0	12	0	1	0	0	0	0	------
Florida:												
Tampa	2	0	------	0	34	0	1	2	0	0	0	1
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	1	------	0	25	0	4	0	1	0	3	12
Nashville	0	0	------	1	1	0	1	0	1	0	0	------
Alabama:												
Birmingham	0	0	------	0	7	0	3	0	0	0	0	1
Mobile	0	0	------	0	2	0	0	1	0	0	0	------
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	2	0	------	0	10	0	0	0	2	0	0	------
Louisiana:												
New Orleans	1	0	------	0	23	1	0	1	7	0	1	2
Shreveport	1	0	------	0	------	0	0	0	2	0	0	------
Texas:												
Dallas	0	0	------	0	17	1	4	3	2	0	0	1
Galveston	0	0	------	0	------	0	0	0	1	0	0	2
Houston	1	1	------	1	6	1	4	3	0	0	0	------
San Antonio	0	2	------	0	8	0	2	10	2	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	7	0	0	0	0	0	0	------
Great Falls	0	0	------	0	21	0	1	0	0	0	0	------
Helena	0	0	------	0	6	0	0	0	0	0	0	------
Missoula	0	0	------	0	4	0	1	0	1	0	0	------
Idaho:												
Boise	0	0	------	0	1	0	0	0	0	0	0	------
Colorado:												
Denver	5	0	1	0	220	0	6	1	13	0	0	3
Pueblo	0	0	------	0	46	0	1	0	1	0	0	2
Utah:												
Salt Lake City	0	0	------	0	65	0	2	0	5	0	0	4

City reports for week ended June 1, 1946—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	2	0	------	0	42	1	1	0	6	0	1	8
Spokane	0	0	1	0	8	2	1	0	0	0	1	1
Tacoma	2	0	------	0	4	0	0	1	6	0	0	11
California:												
Los Angeles	2	0	6	0	192	0	1	3	39	0	0	8
Sacramento	0	0	------	0	74	0	0	0	0	0	0	------
San Francisco	0	0	1	0	79	1	5	0	7	0	0	3
Total	68	5	18	13	5,774	19	266	33	735	0	13	442
Corresponding week, 1945	49	------	23	14	1,659	------	311	------	1,311	0	12	553
Average, 1941–45	57	------	39	[1] 14	[2] 4,861	------	[1] 301	------	1,123	2	18	959

[1] 3-year average, 1943–45.
[2] 5-year median, 1941–45.

Dysentery, amebic.—Cases: New York 1; Chicago 6; Baltimore 1; Little Rock 1; Los Angeles 1.
Dysentery, bacillary.—Cases: Syracuse 2; Chicago 1; Detroit 1; Charleston, S. C., 2; Nashville 1; Los Angeles 1; San Francisco 1.
Dysentery, unspecified.—Cases: Cleveland 1; Omaha 2; San Antonio 46.
Rocky Mountain spotted fever.—Cases: Philadelphia 1; Nashville 1.
Tularemia.—Cases: Duluth 1.
Typhus fever, endemic.—Cases: Atlanta 1; Birmingham 1; Little Rock 1; New Orleans 2; Houston 1; San Antonio 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1943, 34,014,300)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza Case rates	Influenza Death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	0.0	0.0	0.0	0.0	3,019	2.6	57.5	2.6	191	0.0	0.0	180
Middle Atlantic	13.0	0.0	1.4	1.4	708	2.3	39.3	0.5	122	0.0	0.9	39
East North Central	3.1	0.6	1.8	4.3	764	1.8	43.5	2.5	142	0.0	1.8	96
West North Central	9.0	0.0	6.8	0.0	419	4.5	56.3	2.3	81	0.0	4.5	59
South Atlantic	22.9	0.0	0.0	1.6	1,291	1.6	42.5	4.9	56	0.0	0.0	77
East South Central	5.9	5.9	0.0	5.9	207	0.0	47.2	5.9	12	0.0	17.7	77
West South Central	14.3	8.6	0.0	2.9	184	8.6	28.7	48.8	46	0.0	2.9	17
Mountain	39.7	0.0	7.9	0.0	2,939	0.0	87.4	7.9	159	0.0	0.0	71
Pacific	9.5	0.0	12.7	0.0	631	6.3	12.7	6.3	92	0.0	3.2	49
Total	10.5	0.8	2.8	2.0	888	2.9	40.9	5.1	113	0.0	2.0	68

PLAGUE INFECTION IN SAN LUIS OBISPO COUNTY, CALIF.

Plague infection was reported under date of May 31 to have been proved on May 27 in a pool of 393 fleas from burrows and in tissue from 5 ground squirrels, *C. beecheyi*, collected 1 mile north of Pozo, San Luis Obispo County, Calif., and received at the laboratory on April 23, 1946.

TERRITORIES AND POSSESSIONS

Panama Canal Zone

Notifiable diseases—April 1946.—During the month of April 1946, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	5		3				1		9	
Diphtheria	5		1		2		1		9	
Dysentery:										
Amebic	2	1	2		2		2		8	1
Bacillary					2	1	1		3	1
Malaria [1]	2		1		14	1	45	1	62	2
Measles	3				26		5		34	
Meningitis, meningococcus			1	1					1	1
Mumps	1				3		1		5	
Paratyphoid fever	1								1	
Pneumonia		10		3	30	3			[2] 30	16
Poliomyelitis							1		1	
Scarlet fever	1				1				2	
Tuberculosis		26		3	5	1		9	[2] 5	39
Typhoid fever	1						2		3	
Whooping cough					2				[2] 2	

[1] 13 recurrent cases.
[2] Reported in the Canal Zone only.

Puerto Rico

Notifiable diseases—4 weeks ended May 18, 1946.—During the 4 weeks ended May 18, 1946, cases of certain notifiable diseases were reported in Puerto Rico as follows:

Disease	Cases	Disease	Cases
Chickenpox	55	Syphilis	169
Diphtheria	48	Tetanus	11
Dysentery, unspecified	4	Tetanus, infantile	1
Gonorrhea	173	Tuberculosis (all forms)	675
Influenza	58	Typhoid and paratyphoid fever	7
Malaria	203	Typhus fever (murine)	22
Measles	62	Whooping cough	136
Poliomyelitis	1		

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 11, 1946.—During the week ended May 11, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		9		188	272	21	35	12	136	673
Diphtheria		4	2	20	11	1			1	39
Dysentery:										
Bacillary				1					1	2
Unspecified					3					3
German measles				26	39			8	12	85
Influenza		1			9	2	1		7	20
Measles		80	9	738	1,269	61	33	91	6	2,287
Meningitis, meningococcus				2	3	1			1	7
Mumps		1	1		293	88	49	63	226	721
Poliomyelitis								1		1
Scarlet fever		4	6	95	61	9	1	10	5	191
Tuberculosis (all forms)		17	19	150	74	14	11	11	29	325
Typhoid and paratyphoid fever				14	2		1		3	20
Undulant fever					1					1
Venereal diseases:										
Gonorrhea		11	32	85	139	42	50	40	104	503
Syphilis		19	18	126	108	12	10	8	47	348
Whooping cough		3		54	63	9		7		136

CUBA

Habana—Communicable diseases—4 weeks ended May 25, 1946.—During the 4 weeks ended May 25, 1946, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chickenpox	6		Poliomyelitis	13	1
Diphtheria	8		Tuberculosis	10	3
Measles	8		Typhoid fever	14	

Provinces—Notifiable diseases—4 weeks ended May 18, 1946.—During the 4 weeks ended May 18, 1946, cases of certain notifiable diseases were reported in the Provinces of Cuba, as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	5	12	12	23	3	11	66
Chickenpox		21			5	4	30
Diphtheria		8	1	1	1		11
Hookworm disease		24		1			25
Leprosy	2	5				12	19
Malaria	9				1	55	65
Measles		5			2		7
Poliomyelitis		18	9	4	1		32
Tuberculosis	4	51	8	45	18	69	195
Typhoid fever	9	49	9	42	7	57	173
Whooping cough				2	1		3

[1] Includes the city of Habana.

NEW ZEALAND

Notifiable diseases—4 weeks ended April 20, 1946.—During the 4 weeks ended April 20, 1946, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Actinomycosis	1		Poliomyelitis	23	
Cerebrospinal meningitis	9	1	Puerperal fever	5	
Diphtheria	140	6	Scarlet fever	126	
Dysentery:			Tetanus	5	1
Amebic	12		Trachoma	1	
Bacillary	14		Tuberculosis (all forms)	200	31
Erysipelas	24		Typhoid fever	1	
Food poisoning	8		Undulant fever	2	
Malaria	7				

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-March 1946	April 1946	May 1946—week ended—			
				4	11	18	25
ASIA							
Burma	C	121	301				
Bassein	C	7	2				
Moulmein	C	12	25				
Rangoon	C	3					
Ceylon	C		3	5		9	14
China:							
Fukien Province	C	1					
Hunan Province	C	1					
Hupeh Province	C	80	114				
Kiangsi Province	C		[1] 37			[2] 42	
Kwangtung Province	C	302	261				
Canton	C	302	207			[3] 30	
India	C	10,828	11,757				
Calcutta	C	655	434	94	117	63	
Chittagong	C	2	1		3	1	
Madras	C	2					
Indochina (French): Cochinchina	C	18	495		[4] 88		
Chaudok	C	10	11				
Mytho	C	6	120				
Saigon-Cholon	C		14				
Straits Settlements: Singapore	C	[1] 1					
Thailand (Siam)	C	1,279					
Bangkok	C	308					

[1] Imported.
[2] Imported cases for the period Apr. 28 to May 20, 1946.
[3] For the period May 1–20, 1946.
[4] For the period May 1–10, 1946.

PLAGUE

[C indicates cases; P, present]

Place		January–March 1946	April 1946	May 1946—week ended— 4	11	18	25
AFRICA							
Algeria	C	2					
Bechuanaland	C	10					
Belgian Congo	C	2		1			
British East Africa:							
Kenya	C	7	6				
Uganda	C	7	1	1	3		
Egypt	C	26	26	11	8	12	10
Alexandria	C	14	14	10	4	6	5
Ismailiya	C	4	12		3	1	
Port Said	C	1					
Suez	C	7		1	1	5	5
Madagascar	C	115	11		1		
Union of South Africa	C		1				
ASIA							
Burma	C	276	222				
Rangoon	C	48	29				
China:							
Chekiang Province	C	52	82				
Fukien Province	C	432	338	2			
Foochow	C	96	287			[1] 87	
Kiangsi Province	C		[2] 66				
Kwangtung Province	C	211	1				
Yunnan Province	C	11	15				
India	C	9,480	1,572				
Java	C	16					
Manchuria	C	[3] 52					
Mukden	C	[3] 39					
Palestine	C	13					
Thailand (Siam)	C	16					
EUROPE							
Great Britain: Malta	C	2					
Portugal: Azores	C	[4] 12	1				
SOUTH AMERICA							
Bolivia:							
Santa Cruz Department	C	12					
Tarija Department—Plague-infected rats		P					
Ecuador: Loja Province	C	6					
Peru:							
Lambayeque Department	C	8					
Lima Department	C	18					
OCEANIA							
Hawaii Territory: Plague-infected rats		[5] 4					

[1] For the period May 11–20, 1946.
[2] For the period Feb. 21 to Apr. 20, 1946.
[3] Pneumonic.
[4] Includes 2 cases of pneumonic plague.
[5] Plague infection was also proved positive in Hawaii Territory on Feb. 5, 1946, in a pool of 29 rats and on Apr. 13, 1946, in a pool of 54 fleas and 15 lice collected from 7 rats and 22 mice.

SMALLPOX

[C indicates cases; P, present]

Place		January–March 1946	April 1946	May 1946—week ended— 4	11	18	25
AFRICA							
Algeria	C	13					
Basutoland	C	6		2			
Belgian Congo	C	[1] 577	[1] 134	[1] 34	[1] 52		
British East Africa:							
Kenya	C	302	69	6	38		
Nyasaland	C	56	79	8	11	11	13
Tanganyika	C	1,496	170				
Uganda	C	242	47	14			
Cameroon (French)	C	40	19			[2] 2	
Dahomey	C	809	140			[2] 94	
Egypt	C	116	50	17			
French Equatorial Africa	C	122	6				
French Guinea	C	367	175			[2] 5	
French West Africa: Dakar District	C	30	6			[2] 2	
Gambia	C	2		2	1		

See footnotes at end of table.

SMALLPOX—Continued

[C indicates cases: P, present]

Place		January–March 1946	April 1946	May 1946—week ended—			
				4	11	18	25
AFRICA—continued							
Gold Coast	C	593	38				
Ivory Coast	C	304	196			[2] 145	
Libya	C	37	10				2
Mauritania	C		1				
Morocco (French)	C	1,263	272			[2] 142	
Morocco (Int. Zone)	C	129	32			[2] 9	
Nigeria	C	2,575					
Niger Territory	C	246	79			[2] 62	
Rhodesia:							
Northern	C	216	9	5			
Southern	C	1					
Senegal	C	63	5				
Sierra Leone	C	213	16				
Sudan (Anglo-Egyptian)	C	19	6	1	1	4	
Sudan (French)	C	1,543	171			[2] 71	
Togo (French)	C	47	54			[2] 38	
Tunisia	C	30					
Union of South Africa	C	71	P		P		
ASIA							
Arabia	C		1				
Burma	C	418	516				
Ceylon	C	309	33				
China	C	319	120			[2] 84	
India	C	32,695	8,180				
Indochina (French):							
Cochinchina	C	62	40				
Laos	C	9					
Iran	C	21	3				
Iraq	C	2	3				
Japan	C	495					
Malay States [3]	C						5
Palestine	C	1	[4] 1				
Rhodes (Island of)	C				[4] 1		
Straits Settlements	C	[4] 1					
Syria and Lebanon	C	7			1		
Thailand (Siam)	C	7,271					
Turkey (See Turkey in Europe).							
EUROPE							
Czechoslovakia	C	24					
France	C	13				1	
Germany	C				1		
Gibraltar	C	1	1	1			
Great Britain:							
England and Wales	C	[5] 22	11		1	5	[5] 8
Scotland	C	2					
Greece	C	96	17		1		
Italy	C	205	62				
Portugal	C	14	5		1	1	
Turkey	C	10	1				
NORTH AMERICA							
Canada	C	2					
Guatemala	C	54					
Honduras	C	3					
Mexico	C	130	88				
SOUTH AMERICA							
Argentina	C	50	12				
Bolivia	C	229					
Brazil	C	[1] 11	[1] 2				
Colombia	C	309					
Ecuador	C	9					
Peru	C	38					
Uruguay	C	10					
Venezuela	C	[1] 396	[1] 86				[1] 22
OCEANIA							
Hawaii Territory	C	[6] 1					

[1] Alastrim.
[2] For the period May 1–20, 1946.
[3] For the week ended June 1, 1946, 128 cases of smallpox were reported in the Malay States; for the week ended June 8, 74 cases were reported.
[4] Imported.
[5] Includes imported cases.
[6] Off-shipping.

TYPHUS FEVER*

[C indicates cases; P, present]

Place		January-March 1946	April 1946	May 1946—week ended— 4	11	18	25
AFRICA							
Algeria	C	21					
Basutoland	C	2	1				
Belgian Congo [1]	C	1,380	174	87	20		
British East Africa: Kenya	C	12	1	2			
Egypt	C	914	72	19			
Eritrea	C	185	81	12	6	4	
Libya	C	25	4	2	9	10	5
Morocco (French)	C	1,631	681			[2] 381	
Morocco (Int. Zone)	C	23	23			[2] 3	
Morocco (Spanish)	C	1					
Nigeria	C	24					
Rhodesia, Northern	C	1					
Sierra Leone [1]	C	3					
Tunisia [1]	C	126	51				
Union of South Africa [1]	C	52	P				P
ASIA							
Arabia [3]	C	1					
China	C	21	3			[2] 2	
India	C	84	178				
Indochina (French)	C	2					
Iran	C	68	7				
Iraq	C	42	35	13	6	6	12
Japan	C	128					
Palestine [3]	C	21				6	
Straits Settlements	C	1					
Syria and Lebanon	C	41	20	8	2	1	3
Trans-Jordan	C	11	3				
Turkey (See Turkey in Europe).							
EUROPE							
Austria	C	27	3				
Bulgaria	C	467	131	37	41		
Czechoslovakia [1]	C	535	73				
France [1]	C	11		1			
Germany	C	1,743	51	9			
Great Britain: Malta [3]	C	7					
Greece [1]	C	86	118	9	12		
Hungary	C	317	160	56	32	27	
Italy	C	6					
Netherlands	C	15					
Poland	C	1,719	295	136			
Portugal	C	2					
Rumania	C	2,102	613				
Spain	C	1	1		3		
Sweden [3]	C			1			
Turkey	C	674	161	24	23	30	60
Yugoslavia	C	1,992	[4] 227				
NORTH AMERICA							
Costa Rica [3]	C	21	13	3	4		
Cuba [3]	C	4					
Guatemala	C	184	124				
Jamaica [3]	C	12	1				
Mexico	C	344	121				
Panama (Republic)	C	1					
Puerto Rico [3]	C	2	17	5	4	6	1
Virgin Islands [3]	C	1					
SOUTH AMERICA							
Argentina	C	1	1				
Bolivia	C	67					
Chile	C	97					
Colombia	C	91					
Ecuador [1]	C	256	88				
Paraguay	C	1					
Peru	C	107					
Venezuela [1]	C	37	6				
OCEANIA							
Australia [3]	C	45	13				
Hawaii Territory [3]	C	15	2				1

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Includes cases of murine type.

[2] For the period May 1–20, 1946.

[3] Murine type.

[4] For the period Apr. 2–8, 1946.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-March 1946	April 1946	May 1946—week ended—			
				4	11	18	25
AFRICA							
Nigeria: Ibadan	C		1				
SOUTH AMERICA							
Bolivia: Santa Cruz Department	D	[1] 40					
Brazil: Para State	D		1				
Colombia: Caqueta Territory	D	1					
Venezuela:							
Tachira State	C	4					
Trujillo State	C	4					
Zulia State	C	4					

[1] Deaths from suspected yellow fever of which 14 have been confirmed.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

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DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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